

THE RUBIACEOUS GENUS MUSSAENDA: THE SPECIES OF INDIA AND CEYLON

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IN A PREVIOUS PAPER,¹ *Mussaenda*, a genus of the Rubiaceae including some 190 species of the tropics of the Old World, was treated from the morphological point of view with special emphasis on the characteristics and range of variability of the Asiatic species. In the present paper, the species of India and Ceylon are treated from a taxonomic standpoint, and, in a paper to follow, the species of the Philippine Islands will be similarly considered.

Of the fifteen species treated in this study only two are found in Ceylon, one of them being endemic. The other species are distributed in the Western Ghats and neighboring hills and in the Himalayan range in India and Assam. Between these two areas there is a wide gap extending from West Pakistan to Orissa and Andhra Pradesh in which the genus does not occur at all. The species growing in the Western Ghats are of the *Mussaenda frondosa* group with somewhat diffuse inflorescences. Those growing in the Himalayan range belong to the *Mussaenda roxburghii* group with generally compact inflorescences. The plants of both groups bear tufted hairs in the mouth of the corolla tubes, an essentially Indian character. *Mussaendra glabra*, with a very wide range, has its center of distribution in the East Indies, extending to India through Malaysia, and seems to mix freely with indigenous species as shown by the presence of *M. glabra* characters observed in them.

Two new species are described in this paper: *Mussaenda samana*, from Ceylon, and *M. intuspilosa*, from Assam and Burma. These two species were considered by previous workers as within the limits of *M. glabrata* and *M. glabra* respectively. *Mussaenda pentasemia* Fischer is reduced to the status of a form of *M. macrophylla* Wall. var. *macrophylla*.

The characters of the stipules, hairiness within the corolla tube, and the spininess of the seed are used for the first time in the classification of the species. Heterostyly and its association with the hair-length in the corolla tube are amply demonstrated in all species studied.

Since a description of the genus with a discussion of the characters used was given in my previous paper,¹ a repetition here would be redundant. For the sake of brevity, citation of the dates of the collections examined is deliberately omitted and the field notes of collectors are summarized under the distribution of each species. The geographical subdivisions and arrangement of specimen citations are essentially as given on the labels

¹ The rubiaceous genus *Mussaenda*: Morphology of the Asiatic species. Jour. Arnold Arb. 44: 111-126. 1963.

and have not been changed to conform with modern political boundaries.

I am very grateful to the officers of the institutions from which material was borrowed for my study. The institutions, indicated in the citations of specimens by the standard abbreviations of Lanjouw and Stafleu, are those cited by me in the first paper.

ARTIFICIAL KEY TO THE SPECIES OF MUSSAENDA IN INDIA AND CEYLON

- A. Calyx lobes equal, none enlarged into petaloid sepals; branchlets and leaves densely soft white-tomentose; leaves 4.5–7.5 cm. long; stipules 0.4–0.6 cm. long, lanceolate, deeply bifurcate at apex into two subulate lobes; cymes sessile, flowers large; corolla tube 2–2.5 cm. long, velvety, broad at the top, lobes orbicular; berry obovoid, 9 mm. long, puberulous, with persistent calyx teeth; seeds 0.7–0.72 mm. long, testa with 3–10 foveae in each areole. 1. *M. tomentosa*.
- A. Calyx lobes unequal, one calyx lobe enlarged in some flowers to form a petaloid sepal.
 - B. Calyx lobes persistent or subpersistent on the fruit.
 - C. Inflorescence glabrous, cymes almost capitate with filiform calyx lobes.
 - D. Leaves glabrous above, densely tomentose beneath, thick and leathery, 9.5–23.5 cm. long; stipules 1.6 cm. long, very broad, ovate, hairy along the midline of the outer surface, many-veined; calyx lobes scantily pubescent; corolla lobes small, lanceolate; berry ovoid 8 mm. long, seeds 0.36–0.46 mm. long, testa with 2–5 foveae in each areole. 11. *M. keenanii*.
 - D. Leaves glabrous above and minutely puberulous beneath, 8–16.5 cm. long; stipules large, 1.3–1.8 cm. long, hairy along the midline of the outer surface, glands numerous in a continuous band at the base within; calyx lobes glabrous; corolla lobes ovate-lanceolate; berry (immature) oval, 7–8 mm. long, seeds (immature) 0.43–0.46 mm. long, testa with 4–7 foveae in each areole. 10. *M. corymbosa*.
 - C. Inflorescence a crinite softly tomentose or villous cyme; stipules triangular, acuminate, hairy on the outer surface.
 - E. Corolla tube completely hairy within, tufted at the base, 2.4–2.8 cm. long, lobes oblong-lanceolate; inflorescence a somewhat capitate cyme; calyx lobes lanceolate-filiform, glabrous within with a tuft of hairs at the base; leaves 9–28 cm. long, oblong-lanceolate; stipules 0.75–2.3 cm. long, hairy within at the base; berry 8–13 mm. long; seeds 0.6–0.67 mm. long, testa with 4–10 foveae in each areole. 9. *M. roxburghii*.
 - E. Corolla tube not completely hairy within, glabrous at the base, 2–2.3 cm. long, lobes ovate-lanceolate, acuminate; cymes subsessile, densely hairy; calyx lobes linear, hairy; leaves 3.5–11(–18) cm. long, ovate-oblong, densely villous on both surfaces, almost sessile; stipules 0.7–0.95 cm. long, tapering from a broad base, glabrous within, with few glands; berry 13–15 mm. long; seeds 0.9–1.16 mm. long, testa with 2–7 foveae in each areole. 7. *M. incana*.

B. Calyx lobes deciduous from the fruit.

F. Seeds spiny.

G. Calyx lobes very small, 0.12–0.35 cm. long, lanceolate-acuminate; leaves 4–9.2 cm. long, glabrous on both surfaces; stipules 0.35–0.55 cm. long, bifid at apex, appressed pubescent; corolla tube 2.1–3.1 cm. long, lobes broadly lance-ovate; berry ovoid, 13–15 mm. long, seeds 0.83–1.33 mm. long, testa with 4–12 foveae in each areole. 14. *M. samana*.

G. Calyx lobes large, 0.55–1.1 cm. long, linear; leaves 5.5–10.5 cm. long, glabrous above, minutely villous only on nerves beneath, nerves conspicuous, transverse nervules parallel; stipules 0.5–0.6 cm. long, hairy on the outer surface, glabrous within except at the base, bifurcate from apex $\frac{2}{5}$ – $\frac{1}{2}$ their length; corolla tube 2.5–3.3 cm. long, hairy, lobes orbicular-ovate; berry obovoid, 10–12 mm. long, seeds 0.7–0.77 mm. long, testa with 4–11 foveae in each areole. 3. *M. glabrata*.

F. Seeds not spiny.

H. Leaves glabrous on both surfaces.

I. Corolla tube hairy within with a tufted ring of hairs at the base, 2.5–3 cm. long, hairs long in both long-styled and short-styled forms, lobes lanceolate, 4.5–8 mm. long, acuminate; calyx lobes 0.45–0.9 cm. long; berry (immature) small, 7.5–9 mm. long, glabrous or pubescent, seeds 0.53–0.73 mm. long, testa with 3–10 foveae in each areole. 12. *M. intuspilosa*.

I. Corolla tube hairy within as far as the bases of the anthers, 1.4–2.5 cm. long, hairs short in long-styled forms, lobes short, lanceolate, broadly ovate or orbicular; calyx lobes short, 0.1–0.75 cm. long; berry ovoid-elliptic, 10–12 mm. long, glabrous; seeds 0.67–0.83 mm. long, testa with 2–7 or 3–14 foveae in each areole. 15. *M. glabra*.

H. Leaves minutely or densely pubescent on one or both surfaces.

J. Stipules large 1–1.4 cm. long, ovate, densely hairy on both surfaces or on the outer surface only, bifid or bifurcate from apex $\frac{1}{6}$ – $\frac{1}{2}$ their length with numerous or few glands at the base.

K. Calyx lobes broadly oblong-lanceolate, 0.85–1.4 cm. by 0.12–0.4 cm.; leaves 8–20 cm. long, broadly elliptic, minutely hairy on the upper surface, hirsute beneath with 9–11 pairs of lateral veins, stipules 1.2–1.35 cm. long; corolla tube 2.4–3.2 cm. long, hairy, lobes broadly ovate or orbicular, acute; berry broadly ellipsoid, 10–12 mm. long, sparsely hirsute with a broad nectariferous disc, seeds reticulate, 0.9–1.03 mm. long, testa with 2–6 foveae in each areole. 5. *M. macrophylla*.

K. Calyx lobes linear or linear-lanceolate, subulate.

L. Leaves scantily pubescent with short hairs on both surfaces, 7.5–23 cm. long, ovate or elliptic-ovate, acuminate, cuneate with 8–10 pairs of lateral veins, calyx lobes linear, setose-ciliate, glabrous on the inner surface; corolla tube 2.9–3 cm. long; berry 10–13 mm. long, globular, glabrescent; seeds 1.1 mm. long, testa with 2–10 foveae in each areole. 6. *M. treutleri*.

L. Leaves densely hirsute with long hairs on both surfaces,

4.5–11 cm. long, ovate-elliptic to elliptic-lanceolate with 7–9 pairs of lateral veins, petiole very short and hirsute; calyx lobes lanceolate, hirsute on the outer surface, glabrous on the inner surface with a tuft of hairs at the base of each lobe; corolla tube 2.3–3.2 cm. long, lobes ovate; berry globose, 12 mm. long, sparingly hirsute; seeds 1.1–1.16 mm. long, testa with 4–8 foveae in each areole. 8. *M. hirsutissima*.

J. Stipules small, 0.35–1 cm. long.

M. Seeds few (about 80) in the fruit; leaves 8–15.5 cm. long, elliptic, scantily long haired on both surfaces with 7–9 pairs of lateral veins; stipules 0.4–0.67 cm. long, lanceolate, hairy on the outer surface, bifurcate from apex more than $\frac{1}{2}$ their length; cymes sessile, pubescent; calyx lobes linear-ensiform; corolla tube 2.1–2.5 cm. long, lobes suborbicularly ovate; berry 7–8 mm. long, subglobose, scantily pubescent; seeds few, reticulate, 0.9 mm. long, testa with 5–18 foveae in each areole. 13. *M. parryorum*.

M. Seeds numerous (several hundred) in the fruit.

N. Leaves loosely pubescent on both surfaces, broadly ovate, 6–12 cm. long with 7–9 pairs of lateral veins; stipules 0.45–1 cm. long, glabrous inside, bifurcate from apex $\frac{2}{5}$ – $\frac{1}{2}$ their length, lobes curved outwards; inflorescence a lax cyme; corolla tube 2.5–3.2 cm. long, lobes ovate, caudately acuminate; berry obovoid, 10–12 mm. long, sparsely hirsute; seeds 0.67–0.76 mm. long, testa with 4–9 foveae in each areole. 4. *M. laxa*.

N. Leaves densely and softly hirsute especially beneath, variable in shape, 4.4–13 cm. long with 6–10 pairs of lateral veins; stipules 0.35–0.65 cm. long from a broad base, hairy on both surfaces, bifurcate from apex $\frac{1}{4}$ – $\frac{3}{4}$ their length, lobes erect; cyme densely hirsute; corolla tube 2–2.7 cm. long, lobes broadly ovate, apiculate; berry nearly globose, 10 mm. long, slightly scabrous; seeds 0.6–0.8 mm. long, testa with 3–10 foveae in each areole. 2. *M. frondosa*.

1. *Mussaenda tomentosa* Wight in Wall. Cat. 6265. 1832 (TYPE: Wallich 6265).

Erect or straggling shrub with pubescent, lenticellate stems; internodes 2.3–4 cm. long, hairy. Leaves 4.5–7.5 cm. long, 2.2–4.5 cm. broad, velvety-tomentose on both surfaces, more densely so beneath, ovate-elliptic or -lanceolate, acute or obtuse, narrowed at the base, with 6–10 pairs of lateral veins; petiole 1–1.3 cm. long, velvety. Stipules lanceolate, 4–6 mm. long, about 2 mm. broad, hairy on both surfaces, deeply bifurcate at apex, lobes subulate. Inflorescence cymose, terminal and with axillary cymes from the terminal pair of leaves extending beyond the primary cyme, contracted, with no petaloid sepals; bracts and bracteoles elongated, subulate, hairy on both surfaces, caducous, bracteoles trilaciniate, lobes linear. Flowers large, on stout, hairy pedicels shorter than the ovaries. Calyx lobes

linear, subulate, 6–12 mm. long, 1 mm. broad, hairy on both surfaces. Corolla tube 2–2.5 cm. long, hairy on both surfaces, hairs tufted at the mouth; corolla lobes somewhat orbicular, 8 mm. long and broad, apiculate, acute, hairy on the outer surface, papillate within. Ovary 3.5 mm. long, broadly obconic-fusiform, hairy, stigma lobes emerging beyond the mouth through the tuft of hairs (long-styled form). Berry obovoid, about 9 mm. long, 6 mm. in diameter, puberulous, with persistent calyx teeth; seeds minute, reticulate, oblong, oval or triangular-ovate, 0.7–0.72 mm. long, 0.5 mm. broad, testa with 3–10 foveae in each areole.

DISTRIBUTION. This species grows in the Gingee Hills of Arcot, among rocks in the shade, and along the Western Ghats at Kannikatti, Tinnevely, between 500 and 750 meters elevation.

India. CARNATIC: *Wallich 6265* (κ-holotype); *Herb. Wight 1271A* (κ).

Only two specimens, one of which is the type, were available for examination. Both collections are of the long-styled form. The presence of long hairs tufted at the mouth of the corolla tube indicates that this species belongs to the *Mussaenda frondosa* group in which throat hairs in both long-styled and short-styled forms are long and equal in length. It is safe to infer that heterostyly exists in the species.

Mussaenda tomentosa may be distinguished by its sessile cymes without petaloid sepals, velvety tomentum on stems and leaves, deeply bifurcate lanceolate stipules hairy on both surfaces, and obovoid fruits with persistent calyx segments.

2. *Mussaenda frondosa* L. Syst. Nat. ed. 10. 2: 931. 1759 (TYPE: *Hermann*). FIGS. 1, o, and 4.

M. fr[uctu] frondoso L. Sp. Pl. 1: 177. 1753.

M. zeylanica, flore rubro, fructu oblongo, polyspermo, etc. Burm. Thesaurus Zeyl. 165. pl. 76. 1737.

M. formosa L. Mantissa Pl. ed. 6. 45. 1767.

M. fruticosa L. Syst. Nat. ed. 12. 168. 1767.

M. sumatrensis Roth, Nov. Pl. Sp. Indiae Orient. 152. 1821.

M. flavescens Buch.-Ham. Trans. Linn. Soc. 14: 203. 1824.

M. dovinia Buch.-Ham. *ibid.*

M. belilla Buch.-Ham. *ibid.*

M. macrophylla sensu Kurz, Forest Fl. Brit. Burma 2: 57. 1877, non Wallich.

M. ingrata Wall. ex Hook. f. Fl. Brit. India 3: 89. 1880.

M. tomentosa Wight ex Hook. f. *ibid.* 88.

M. villosa Wall. ex Hook. f. *ibid.* 91.

Cercophyllum grandiflorum Meyen, Reise um die Erde 2: 234. 1835.

Scandent shrub; young stems hirsute, curving gracefully over other shrubs, older stems glabrate, reddish or blackish brown, lenticellate. Leaves opposite, lamina ovate, elliptic, orbicular, lanceolate, oblong or obovate, 4.4–13 cm. long, 2–8.3 cm. broad, short-acuminate, acute, base cuneate, obtuse or rounded, rather scantily hirsute on the upper surface, densely and softly white tomentose on the lower surface; primary lateral veins

6–10 pairs, more prominent on the lower surface and more hairy; petiole 0.35–2.1 cm. long, densely hirsute with gray or brownish hairs. Stipules 3.5–6.5(–9.5) mm. long, oblong-ovate, broadly triangular or oblong from a broad base narrowing toward the apex and bifurcate $1/4$ – $3/4$ their length, lobes straight, not curved, hairy on both surfaces, with few to many glands in two groups at the base inside. Inflorescence terminal, of small, contracted, dichotomously branched, densely hirsute, few-flowered cymes; bracts and bracteoles subulate, pubescent and caducous, bracteoles trifold. Flowers heterostylous, on stout, pubescent pedicels as long as the ovaries. Calyx lobes deciduous, narrowly linear, 6.5–15 mm. long, 0.5–1.5 mm. broad, pubescent on the outer surface, usually glabrous within (rarely pubescent) with one pair of glands at the base of each; petaloid sepal creamy white, ovate or oblong-ovate, 3.7–12 cm. long, 2.2–8.9 cm. broad, acuminate, subacute at apex, short or long attenuate or cuneate at base, puberulous on the upper surface, hirsute below, 3- or 5-veined, hairs denser on veins, “petiole” 0.9–2.5 cm. long, hirsute. Corolla tube 2–2.7 cm. long, hairy on the outer surface, hairs denser toward the broader apex, densely hairy within as far as the bases of the anthers, lower down scantily short hairy, as far as $1/10$ – $1/4$ of the tube from the base, hairs ligulate, linear, 1.2–1.5 mm. long in both long-styled and short-styled forms, tufted at the mouth, shorter below the anthers; corolla lobes broadly ovate, 3–4.5 mm. long, 4–5 mm. broad, apiculate, hairy on the outer surface, papillate within. Stamens with short filaments inserted $1/2$ way on the tube in long-styled forms, $3/4$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 4.5–5.5 mm. long, bilobed at the sterile base, pollen grains of short-styled forms larger. Ovary 3–4 mm. long, obconical or turbinate, hairy, 2-locular, with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 1.6–2.5 cm. and 2–5.5 mm. long respectively in long-styled forms, 1–1.5 cm. and 2.5–4 mm. long in short-styled forms. Berry nearly globose, 1 cm. long, sparsely hirsute; seeds minute, reticulate, 0.6–0.8 mm. long, 0.5–0.6 mm. broad, somewhat rounded or pyriform, albuminous, testa with 3–10 foveae in each areole; germination epigeal.

ILLUSTRATIONS. Burmann, Thesaurus Zeyl. *pl.* 76. 1737; Lindley, Bot. Reg. 6: *pl.* 517. 1820; Wight, Illust. Indian Bot. 2: *pl.* 124. 1850; Beddome, Fl. Sylv. S. India 2(Anal. Gen.): *pl.* 16, *fig.* 3. 1873.

DISTRIBUTION. The actual geographical range of this species is in doubt. Merrill (1910) says that “none of the Ceylon material matches any of our Philippine specimens and our Philippine specimens apparently closely match some Javan and Caroline Islands material distributed as *M. frondosa* Linn. and *M. glabra* Vahl.” Further he says that “the typical form of the Linnaean species does not extend to the Archipelago.” These observations are confirmed by an examination of collections from the Malayan Archipelago and the Pacific Islands distributed as *Mussaenda frondosa*. Valetton (1926), basing his observations on König’s collection from Ceylon, excludes *M. frondosa* from New Guinea and Java. The plant

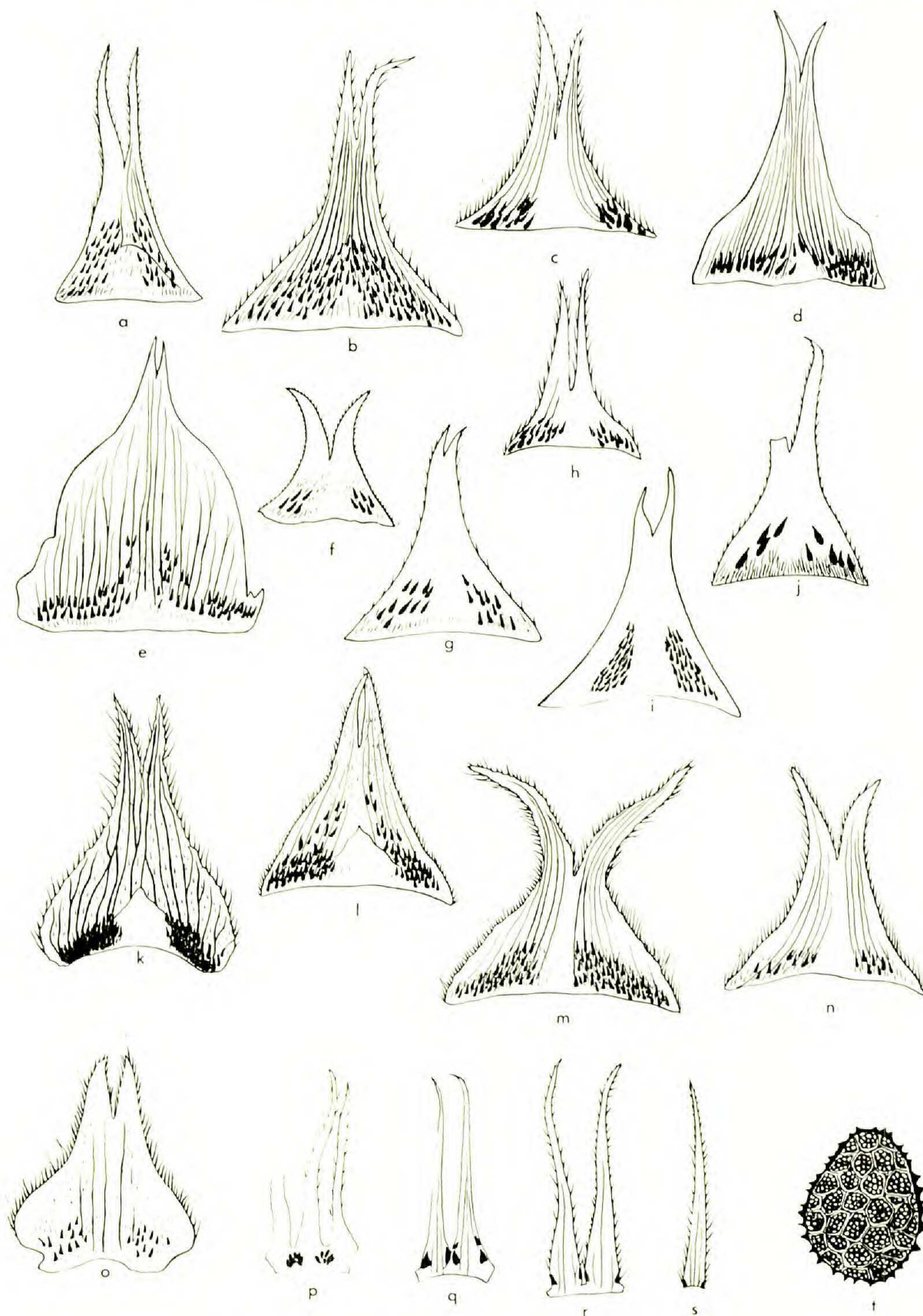


FIG. 1. a-o, stipules of some Indian species of *Mussaenda* spread out and viewed from the adaxial surface to show distribution of hairs and glands; p-s, calyx lobes from within; t, seed. a, *M. roxburghii* (Wallich G 6252), $\times 2\frac{1}{2}$; b, *M. roxburghii* (Gamble 10476), $\times 3$; c, *M. incana* (Herb. Griffith 2781), $\times 3\frac{1}{2}$; d, *M. corymbosa* (Herb. Wallich 954), $\times 2\frac{1}{2}$; e, *M. corymbosa* (Herb. East India Co. 2779/1), $\times 2\frac{1}{2}$; f-j, *M. glabra* showing variation in hairiness and in bifurcation at apex (f, Hooker & Thomson 17, Chusa, Khasia, $\times 4\frac{1}{3}$; g, Rock 712, $\times 4$; h, Siedenfaden 2696, $\times 4\frac{1}{2}$; i, Herb. Helfer 2778, Burma, $\times 3\frac{1}{2}$, note glabrousness; j, Henry 3118, $\times 4$, note large glands); k, *M. macrophylla* (Parry 274), $\times 2$; l, *M. treutleri* (Hooker & Thomson 20), $\times 1\frac{3}{4}$; m, *M. hirsutissima* (Barnes 120), $\times 2\frac{1}{2}$; n, *M. glabrata* (Hooker & Thomson 23), $\times 3\frac{1}{2}$; o, *M.*

described as *M. frondosa* from the Moluccas is in his opinion *M. reinwardtiana* Miq. In addition, he does not think that collections from Fiji, the Caroline Islands, and the Samoan Islands distributed as *M. frondosa* are this species.

Stapf (1894) in assigning the collection *Haviland 1355* from Kinabalu to *Mussaenda frondosa* was not quite sure of the specimens he had examined. Short-styled and long-styled flowers never occur together in an inflorescence nor on the same plant. He seems to have examined a flower in which the throat hairs had been eaten by an insect, shown by the presence of its excrements. I have come across several specimens in similar condition from India, the Philippine Islands, and New Guinea.

Pitard's (1923) description of *Mussaenda frondosa* from Annam and Indo-China does not agree with typical material. He seems to be describing a glabrous-leaved form with sepals 2–2.5 mm. long and petals oblong, 4 mm. long, 2.5 mm. broad.

Mussaenda frondosa therefore occurs in India, extending as far as Nepal, Assam, the Khasia Mountains, and the Andaman Islands, and southward along the Western Ghats from Concan as far as Ceylon. Unfortunately no material was available for examination from Nepal, Assam, the Khasia Mountains, and the Andaman Islands.

India. Kodaikanal Region, Pulney Hills, *Fr. Anglade* (A); Yellapur-Karwar District, *Nana 5816* (K); *Herb. Wight 1267* (NY), *1305* (C); Concan, *Herb. Hooker & Thomson* (GH); *Herb. Rottboell* (C); *Herb. Schum.* (C); *Herb. Hofman Bang, Wallich* (C); Calcutta, *Wallich 434* (C).

Ceylon. MID-COUNTY WET ZONE: *Konig* (C); Peradeniya, *Gardner 333* (K); *De Silva 38* (A), *210* (NY); *Jayaweera 8, 12–15* (A); Dolosbage, *Jayaweera 1* (A); *Thomson 1845* (K); *Fraser 135* (US); *Rostrup 99* (C). LOW-COUNTRY WET ZONE: *Hermann* (BM—lectotype, upper specimen; syntype, lower specimen on same sheet as lectotype); Ratnapura District: ("J" designates *Jayaweera*, all in A) Kotamulla, *J2*; Idellana, *J3*; Elapatha, *J4*; Algoda, *J5*; Kohiladeniya, *J7*; Foot of Adam's Peak, *J29*; Gilimale, *J22*. WET MONTANE ZONE: Labookelle, *J16*; Ramboda, *J17*, Rangala *J18, J19*; Hewaheta, *J20*; Ginigathhena, *J27*; Palugama, *J30–34*; Peragala, *J35*. DRY MONTANE ZONE: Welimada, *J41*. DRY ZONE: Nalanda, *J9*; Pannampitiya *J10, J38, J40*; Ritigala, *J11*; Weragantota, *J23*; Bibile, *J24–26*; Dambulla, *J36*; Kurunegala, *J37*; Kodikaragamuwa, *J39*; Sigiriya, *Cooley & Siyambalagastenne* (US). **China.** Kwangtung University Campus (probably cultivated), *Metcalf 17245* (A).

It is difficult to determine the characters of the type from a photograph of Hermann's original specimen but a drawing in Burmann's *Thesaurus Zeylanicus*, supported by a large number of dissections from Ceylonese material, brings out the characters very clearly.

Mussaenda frondosa has been the subject of much discussion, and in the absence of clearly defined characters many collections from Assam,

frondosa (Jayaweera), $\times 4$. p-s, calyx lobes of *M. keenanii*, $\times 2$; *M. corymbosa*, $\times 2\frac{3}{4}$; *M. treutleri*, $\times 2\frac{1}{2}$, and *M. glabrata*, $\times 2\frac{1}{4}$, respectively. t, seed of *M. glabrata*, $\times 25$, note spininess.

Burma, Siam, China, Malacca, the Nicobar Islands, the Moluccas, Sumatra, Java, Borneo, Celebes, Fiji, the Philippines, and the Caroline Islands have been erroneously referred to this species. These are correctly referred to various others, including *M. macrophylla*, *M. sanderiana*, *M. erosa*, *M. villosa*, *M. laxiflora*, and *M. philippica*.

Frère Anglade's collection from the Kodaikanal Region, Nana's collection from Karwar, Hooker and Thomson's from Concan, and Wallich's from Calcutta agree with the typical material from Ceylon, the only difference being the longer stipules which are hairy within at the base only, a character of *Mussaenda glabrata*. Voigt's collection (c) from Calcutta, presumably from cultivated specimens is, I think, *M. glabra* with its characteristic glabrous leaves with 4–6 pairs of lateral veins, small stipules, glabrous within with few glands, short, lanceolate calyx lobes, glabrous petaloid sepals and lanceolate or oblong-lanceolate corolla lobes. Both Merrill and Bremekamp, however, have annotated this as *M. frondosa*.

The collection *Erlanson 5614* (NY) from Travancore is of special interest. The character of the leaves and stipules are typically those of *Mussaenda glabrata* while the floral characters are distinctly those of *M. frondosa*. It was gathered from an area where the two species overlap. *Kamphovener 528* (c) from Calcutta and Serampore has similar characters, but the corolla tube is much shorter (1.9 cm. long), the leaves elliptic and entirely glabrous above, pubescent on veins beneath, and the stipules glabrous within except at the base. In Calcutta and Serampore the two species concerned do not occur in the natural state.

I do not agree with Bentham (1861) that the plant figured in Curtis' *Botanical Magazine* (pl. 2099) as *Mussaenda pubescens* Ait. is *M. frondosa*. It differs much from the material of *M. frondosa* examined and figured elsewhere, in its glabrous stems, leaves and inflorescence, and its diverging, linear, stipular teeth, which are characteristic of *M. pubescens*.

Mussaenda frondosa differs from other species in habit and pubescence and is easily distinguished by its straight stipular teeth; long, deciduous calyx lobes which are linear and more than twice the length of the ovary (or about half the length of the corolla tube) bearing a single pair of glands at the base of each; in the dense hairiness of the corolla tube within, as well as on the outer surface; and in the hairs of the throat equal in length and equally dense in both the long-styled and short-styled forms, but tufted at the mouth.

USES. *Mussaenda frondosa* is used medicinally in India and Ceylon. Different parts of the plant are used for the treatment of different diseases. In India the root is used for the treatment of white leprosy, the petaloid sepals for jaundice, the flowers for asthma, intermittent fevers, and dropsy; also, the leaves are used externally as a detergent for ulcers. In Ceylon, on the other hand, the plant is not used internally but, the leaves and flowers are employed externally in the form of a decoction to remove inflammations.

3. *Mussaenda glabrata* (Hook. f.) Hutch. ex Gamble, Fl. Madras 2: 610. 1921 (TYPE: *Herb. Wight 1269*). FIG. 1, n, s, t.

M. frondosa var. *glabrata* Hook. f. Fl. Brit. India 3: 90. 1880.

Climbing shrubs; stems nearly glabrous except at nodes or scantily pubescent, lenticellate. Leaves opposite, lamina narrowly or broadly elliptic, 5.5–10.5 cm. long, 3.3–6 cm. broad, glabrous or subglabrous on the upper surface, sparingly hairy and villous on conspicuous nerves beneath, short acuminate, somewhat cuneate at base, primary lateral veins 6–8 pairs, transverse nervules parallel; petiole 0.6–2.5 cm. long, pubescent. Stipules ovate, 5–6 mm. long, 3.5–5 mm. broad at the base, hairy on the outer surface, glabrous on the inner surface except at the base, hairs of medium length dispersed among numerous glands (about 22 pairs) at the base, bifurcate from apex about $2/5$ – $1/2$ their length, lobes diverging. Inflorescence a terminal, rather spreading, dichotomously branched, pubescent cyme; bracts and bracteoles lanceolate, hairy, caducous, bracteoles broader at base, trifid at apex. Flowers heterostylous on stout, pubescent pedicels shorter than the ovaries. Calyx lobes 5.5–10.7 mm. long, 0.8–1 mm. broad, linear, narrowing to a point at the apex, hairy on the outer surface, glabrous within with one or two pairs of glands at the base of each; petaloid sepal ovate, 3.3–9.5 cm. long, 3.3–5.3 cm. broad, shortly acuminate, cuneate, puberulous above and below, hirsute on veins on the lower surface, “petiole” 2–2.7 cm. long. Corolla orange, the tube 2.5–3.3 cm. long, hairy on the outer surface, more densely so towards the broader end, rather densely hairy within as far as the bases of the anthers, farther down the hairs shorter and scantier to $1/5$ – $1/4$ the length of the tube from the base, hairs equal in length (1.5–2 mm. long), tufted at the mouth in both the long-styled and short-styled forms; corolla lobes orbicular-ovate, 2.5–5.5 mm. long, 5–5.5 mm. broad, apiculate, hairy on the outer surface, papillate within. Stamens with short filaments inserted halfway on the tube in long-styled forms and $3/4$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 6.2–7 mm. long, bilobed at the sterile base. Ovary 3.5–4 mm. long, broadly fusiform, hairy, 2-locular, ovules numerous on cushion-shaped axile placentae; style and stigma lobes 2.7 cm. and 3.5 mm. long respectively in long-styled forms, 1.6 cm. and 4.5 mm. long in short-styled forms [measurements taken from flowers with corolla tubes over 3.2 cm. in length]. Berry obovoid, 1–1.2 cm. long, glabrous, calyx lobes deciduous; seeds oblong or ovate, 0.7–0.77 mm. long, 0.56 mm. broad, testa spiny with 4–11 foveae in each areole.

DISTRIBUTION. *Mussaenda glabrata* occurs along the Western Ghats extending from North Kanara through Malabar, Nilghiri and Tinnevely hills from sea level upwards. I have not seen it in Ceylon, and it is very doubtful whether its distribution extends that far. Two collections of *M. glabrata* from the Botanic Gardens, Calcutta, presumably from plants under cultivation as *M. corymbosa* and *M. frondosa* were examined, one labelled as from Ceylon and the other as from Malabar.

India. MYSORE: Karwar, North Kanara District, *Bell* 7807 (K); *Puri* 1158 (BSI); Mangalore, *Hohenacker* 170 (C, K). KERALA: Mount Nilghiri & Kurg, (*Herb. Hook. & Thomson*) *Thomson* 22 (GH), 23 (GH, K); *Herb. Wight* 1307 (GH), *Herb. Wight* (GH); *Herb. Wight* 1269 (K-lectotype; C, NY); *Herb. Wight* 1270 (K-syntype; NY). CULTIVATED: Bot. Gard. Calcutta, *Herb. Torrey* (NY), ? Ceylon & Halabar, *Voigt* (C).

The collection *Thomson* 23 seems to be from more than a single shrub, for both long-styled flowers (with longer calyx lobes) and short-styled flowers are represented. Voigt's collection has leaves which are puberulous on the upper surface and conspicuously hirsute on the veins and parallel venules on the lower surface. The stipules and flowers are characteristic of *M. glabrata*. The other sheet from the Calcutta Botanic Garden has two mounts, the top specimen being *M. roxburghii* and the lower one probably *M. glabrata*.

The collection *Jacob* 17518 (K), from Madura, is of doubtful identity; it differs from *M. glabrata* in the deeply bifurcate stipules which are pubescent within, long-petioled leaves, and doubtfully spiny seeds.

Heterostyly is clearly displayed in this species, but the throat hairs in both the long-styled and short-styled forms are long and dense.

Mussaenda glabrata may be distinguished by its glabrous berries with spiny seeds (a character separating it from the other Indian mussaendas); glabrous leaves, villous on conspicuous nerves beneath; small, hairy stipules glabrous inside except at the base and bifurcate at the top; and larger anthers.

4. ***Mussaenda laxa*** (Hook. f.) Hutch. ex Gamble, Fl. Madras 2: 610. 1921 (TYPE: *Herb. Wight*, 1836).

M. frondosa var. *laxa* Hook. f. Fl. Brit. India 3: 89. 1880.

Climbing shrub; stems hirsute, lenticellate. Leaves opposite, lamina broadly ovate, 6–12 cm. long, 3–7.2 cm. broad, abruptly short-acuminate, cuneate or rounded at the base, sparsely pubescent on the upper surface, loosely pubescent on the paler lower surface, more densely so on the veins, hairs usually long (sometimes short), loosely dispersed and not matted together, primary lateral veins 7–9 pairs, prominent on the lower surface, transverse nervules not prominently parallel; petiole 0.6–3.5 cm. long, slender or stout, subglabrous or hirsute. Stipules 4.5–10 mm. long, 2.5–5 mm. broad at the base, ovate, densely hairy on the outer surface, glabrous within except at the base where long hairs form a screen over the few glands, bifurcate from apex for about $2/5$ – $1/2$ their length, lobes curved outwards. Inflorescence a terminal, very lax, few-flowered di- or trichotomous, pubescent cyme; bracts and bracteoles lanceolate, hairy, 5.5–8 mm. long, bracteoles broader at the base and trifid at the apex, caducous. Flowers heterostylous, on short, pubescent pedicels shorter than the ovaries. Calyx lobes deciduous, narrowly linear, 6–17(–19) mm. long, 1–1.5 mm. broad, hairy outside, glabrous or hairy inside with 1–3 pairs of glands at the base of each; petaloid sepal ovate, 7.5–10 cm. long,

3.5–6.5 cm. broad, short-acuminate, cuneate at base, subglabrous or puberulous on the upper surface, minutely pubescent or sparsely hirsute on the lower surface, more densely so on the veins, 5-veined, "petiole" 1.3–2.5 cm. long, pubescent. Corolla tube 2.5–3.2 cm. long, hairy on the outer surface, more densely so toward the broader end, hairy within, densely so in short-styled forms and sparsely in long-styled forms as far as the base of the anthers, hairs equal in length (1.5 mm. long) in both forms and tufted at the mouth, hairs below the anthers shorter and scantier as far as $1/5$ – $1/4$ the length of the corolla tube from the base; corolla lobes ovate, 5.5–7 mm. long, 6 mm. broad, caudate-acuminate, hairy on the outer surface, papillate within. Stamens with short filaments inserted midway on the tube in long-styled forms and $4/5$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 6–6.8 mm. long, straight or slightly curved, bilobed at base. Ovary 3.7–4.5 mm. long, obconical or broadly fusiform, hairy, 2-locular, with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 2.8 cm. and 3.5 mm. long respectively in long-styled forms, 1.65 cm. and 4.5 mm. long in short-styled forms. Berry obovoid, 1.1–1.2 cm. long, sparsely hirsute; seeds minute, reticulate, ovate, oblong or oval, 0.67–0.76 mm. long, 0.39–0.67 mm. broad with 4–9 foveae in each areole of the testa.

DISTRIBUTION. This species grows along the west coast of India and in the Western Ghats from sea level to about 1000 meters elevation. It extends from Konkan southward as far as Travancore, and inland from Mysore to Tinnevely and Nilghiri hills. It has been collected in flower from April to July, October, and November; in fruit in June, October, and November.

India. BOMBAY: Malabar, Concan, etc., *Herb. Hooker & Thomson, Stocks, Lau*, etc. (c); Ram Ghat, *Richie 242* (κ); Yellapur-Sahasarali, *Fernandes 1642* (A); Manchikeri, *Fernandes 1565* (A); Samkhand Sirsi Taluka, *Garade* (BSI). MYSORE: Maisor & Carnatic, *Herb. Hooker & Thomson, Thomson* (κ); Mangalor, *Hohenacker 170* (κ). KERALA: *Anstead 30* (A); Quilon, *Herb. Wight, 1836* (κ-holotype). MADRAS: Nilghiri, *Gamble 20541, 12180, 15598* (κ); Billigirirangan Hills, *Barnes 403* (A). Ind. Orient: *Herb. Wight 1306* (c, GH in part), Kew distribution 1866–7; *Wallich, 1816* (A).

Gamble's description of *Mussaenda laxa* does not seem to have included collections from Bombay Presidency. Stocks' collection, however, differs from the type in its narrow elliptic leaves, attenuate at the base and with long petioles, while *Fernandes 1642* and *1567*, annotated by Razi as *M. glabrata*, agree with the type material rather closely but for the smaller leaves and more prominent veins on the lower surface. I think this material is *M. laxa*. The collection *Hohenacker 170* has leaves which are more or less glabrous on the upper surface and minutely pubescent on the veins beneath but agrees with the type in the pubescent stems, lax inflorescences, and stipular and floral characters, while *Anstead 30* from the coast of Kerala has smaller and less hairy leaves and shorter stipules. In *Barnes 403* the bifurcation of the stipules varies from $2/5$ to $1/2$ their

length from the apex. In all these collections both short-styled and long-styled forms have in the throat of the corolla tube long hairs of equal length which are tufted at the mouth of the tube; the hairs in the long-styled forms are less dense.

The chief distinguishing characters for *Mussaenda laxa* are, therefore, the loosely pubescent stems and leaves; lax inflorescences; stipules bifurcate about 1/2 their length, lobes curving back and glabrous inside, fewer glands and long basal hairs forming a screen over them; broadly ovate, caudate-acuminate corolla lobes; longer anthers and sparsely obovoid, hirsute fruits.

5. ***Mussaenda macrophylla*** Wall. in Roxb. Fl. Indica ed. Carey & Wall. 2: 228. 1824 (TYPE: *Wallich* 6255). FIG. 1, k; FIG. 3, j-l.

M. hispida D. Don, Prodr. Fl. Nepal. 139. 1825, non Engl.

M. calycina Wall. Cat. 6253. 1830 (*nomen nudum*).

M. frondosa sensu Wall. Cat. 6250A. 1830, non L.

A large, subscandent shrub with stout branches densely pubescent with grayish hairs remaining gray or becoming rufous brown when dry. Leaves elliptic, broadly ovate, or elliptic-lanceolate, 8–20 cm. long, 3.8–10.5 cm. broad, subglabrous or pubescent on the upper surface, entirely hirsute or hairy on veins and venules only on the lower surface, short acuminate, cuneate at the base with 9–11 pairs of primary lateral veins arcuate and conspicuous on the lower surface; petioles 0.8–4 cm. long, densely hirsute. Stipules large, ovate, 1.2–1.35 cm. long, 6–9.5 mm. broad at the base, bifurcate from the apex 1/6–2/5 their length, lobes diverging, densely hairy outside, glabrous or hairy inside with few or numerous glands in two bundles at the base. Inflorescence a terminal, compact or spreading, trichotomously branched, pubescent, corymbose cyme; bracts and bracteoles large, very hairy, lanceolate, acuminate, bracteoles usually in opposite pairs, deeply divided into 2 or 3 lanceolate, acuminate lobes. Flowers large, heterostylous, nearly sessile or on very short, stout, pubescent pedicels. Calyx lobes narrowly or broadly oblong-lanceolate, 8.5–14 mm. long, 1.2–4 mm. broad, acuminate, margin smooth or irregular, hairy on the outer surface, scantily pubescent or glabrous within with 1–3 pairs of glands at the base of each sepal; petaloid sepal white with faintly green veins, ovate or broadly lanceolate, 6–9 cm. long, 2.5–6.7 cm. broad, glabrous on both surfaces except on veins below, or puberulous on the upper surface and hirsute below, “petiole” 1.7–2.5 cm. long, hirsute. Corolla tube greenish, 2.4–3.2 cm. long, hairy on the outer surface, hairs spreading horizontally or directed forward especially toward the broader end, tube hairy within at the throat as far as the bases of the anthers, and tufted at the mouth, hairs long in both long-styled and short-styled forms but less dense in the former, hairs shorter and scantier below the anthers extending as far as to about 1/12 to 1/4 the length of the corolla tube from the glabrous base; corolla lobes yellow, broadly ovate or orbicular, 4–5 mm. long, 4–6.5 mm. broad, acute, apiculate or caudate, pubescent

on the outer surface, papillate within. Stamens with short filaments, epipetalous about $1/2$ way up the tube in long-styled forms and $3/5$ – $3/4$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 5–5.7 mm. long, bilobed at the base. Ovary 3.5–4.5 mm. long, broadly fusiform, hairy, 2-locular, with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 1.65–2.3 cm. and 2.5–3.5 mm. long respectively in long-styled forms, 0.9–1.4 cm. and 3.5–4 mm. long in short-styled forms. Berry dark purple, oblong-ovoid, 1–1.2 cm. long, sparsely hirsute, with very board nectariferous scars, calyx lobes deciduous; seeds minute, reticulate, oblong-ovoid, 0.9–1.03 mm. long, 0.73 mm. broad, embedded in a soft, fleshy pulp, hilum conspicuous, testa with 2–6 foveae in each areole.

DISTRIBUTION. This species grows in the tropical Himalayan range of hills at an elevation of 300 to 1500 meters above sea level, extending from Nepal through Sikkim, Khasia, Assam, and Burma to Yunnan in China. Collections from the Andaman and Nicobar Islands were not available for examination. Collections from the Philippine Islands differ sufficiently from the typical to be treated as a variety. In connection with the distribution of the species Merrill (1908) says, "The exact identity of the Philippine forms referred to this species is doubtful." It has been collected in flower from May to August, and in October; in fruit in June, November, December, and January.

India. NEPAL: Wallich (C, GH), *Wallich Cat.* 6255 (K-holotype; GH, NY-isotypes). SIKKIM: *Herb. Kuntze* 7083 (NY); Darjeeling, *Cowan* (US). KHASIA: *Hooker & Thomson* (GH, K). ASSAM: Lushai Hills, *Parry* 274 (K); Jotsoma, Naga Hills, *Bor* 6360 (K); Kilomi, *Bor* 5054 (K); Cachar Hills, Hajlong, *Craib*, 1909 (K); Kala Naga, *Watt* 6926 (K); Jotsoma, *Prain*, 1886 (A); Pynursla, *Biswas* 4038 (A); Margarata, *Prain's collector* (A); Manipur, *Watt* 5050 (K); Tirap River Valley, *Juan* 179 (K, US); *Belcher* 145 (US); Namchik River Valley, *Belcher & Juan* 73 (K, US); 19 miles from Ledo, *Juan* 158 (A). **Burma.** Myitkyina, *White* 2 (US). **China.** YUNNAN: Szemao, *Henry* 12265 (A); Banchiou-chiam, Cheli-Hsien, *Wang* 79595 (A); Fo-Hai, *Wang* 74675 (A); Mienning, *Gewanshuei*, *Yu* 17681 (A).

The type specimen described by Wallich obviously refers to *Wall. Cat.* 6255, although Hooker (1880) erroneously cited the number 6295 which refers to *Hopea wightiana*. Wallich's and Lindley's figures referred to by them (*Pl. As. Rar.* 2: *pl.* 180. 1832, and *Bot. Reg.* 32: *pl.* 24. 1846 respectively), are of *Mussaenda treutleri*, a species which had been confused with *M. macrophylla* but was distinguished and described by Stapf in 1909.

Mussaenda macrophylla has a wide range of variation in the characters of the leaves, pubescence, inflorescences, and flowers; its stipule character, however, seems to be more or less constant.

The collections from Assam, *White* 2, *Juan* 158, *Belcher* 145, *Juan* 179, *Belcher & Juan* 73 referred to earlier as *Mussaenda frondosa*, show the greatest amount of variation. In these the leaves are lance-elliptic, somewhat glabrous, the stipules are glabrous within, and the inflorescences compact (*Belcher & Juan* 73) or diffuse (*Belcher* 145, *Juan* 158, 179). The

sepals are linear-lanceolate with ovate-caudate petals (*Belcher 73*) or broader and with ovate, acute, or apiculate petals (*White 2, Belcher 145*). The corolla tube in *Belcher 145* is hairy within to the base, indicating an affinity with *M. hirsutissima* and *M. roxburghii*. The Chinese collections agree well with those from India.

Heterostyly is demonstrated clearly in *Mussaenda macrophylla* with both long-styled and short-styled forms. As in *M. frondosa*, the throat hairs are long and tufted at the mouth in both forms. The affinities of the species are with *M. treutleri* from which it may be distinguished by the oblong-lanceolate calyx lobes, ovate stipules, bifurcate at apex and with diverging lobes, the hairs of the outer surface of the corolla tube somewhat horizontal and not appressed, the ellipsoid, rugose berry, and smaller seeds with fewer foveae in the areoles of the testa.

Mussaenda macrophylla is distinguished from other species of the genus by the hairiness of its stems, leaves, inflorescences, and flowers, by its larger stipules densely hairy on both surfaces, its broadly lanceolate sepals and its large, pubescent berries with broad nectariferous scars, as well as by its larger seeds with fewer foveae in the areoles of the testa.

***Mussaenda macrophylla* Wall. forma *grandisepala*, stat. et nom. nov.**

M. pentasemia Fischer, Kew Bull. 1928: 275. 1928.

Spreading shrub 2–3 m. tall, stems terete, pilose, branches densely villous. Leaves opposite, subequal, elliptic or ovate, 7–12 cm. long, 2.5–6 cm. broad, acute or acuminate, cuneate and more or less decurrent at the base, scantily pilose on the upper surface, appressed pilose on veins below with 7–9 pairs of lateral veins; petiole 0.5–1 cm. long, densely villous. Stipules broadly ovate, 5–10 mm. long, about 5 mm. broad, hairy on both surfaces and bifurcate at apex. Inflorescence a terminal, few-flowered, pubescent cyme; bracts and bracteoles lanceolate, densely hairy on both surfaces; bracteoles broader, trilobed, the midlobe linear, subulate, much longer than the lateral lanceolate lobes. Flowers (long-styled forms) subsessile on stout, hairy pedicels much shorter than the ovaries. Calyx lobes all petaloid, petiolate, elliptic-lanceolate or elliptic-oblong, 2–7 cm. long, 0.5–4 cm. broad, acuminate, attenuate at the base, scantily pubescent on the upper surface, setose on veins below, “petioles” 0–2.5 cm. long, setose. Corolla brownish yellow, the tube 2 cm. long, cylindrical, slightly broader at the top, hairy on the outer surface at the mouth and throat as far as the bases of the anthers, then the hairs becoming shorter and scantier, extending as far as $\frac{1}{4}$ the length of the tube from the base; lobes orbicular-ovate, 3.5 mm. long, 4.5 mm. broad, apiculate, hairy on the outer surface, papillate within. Stamens with short filaments attached about halfway up on the tube; anthers linear, dorsifixed, introrse, 5.2 mm. long, bilobed at the base. Ovary infundibuliform, 4–5 mm. long, densely villous; style filiform, stigma bilobed. Berry not seen.

DISTRIBUTION. This form of the species was collected in flower at Nhatial in the Lushai Hills, Assam, at an elevation of 925 meters, in July, 1927, by Mrs. N. E. Parry. It has not been collected since.

The collection *Parry 275* (κ) which is the type specimen of *Mussaenda pentasemia* was available for examination. There seems to be no difference in characters between this and the typical *M. macrophylla* except in the petaloid development of all five calyx lobes. The specimen *Parry 274* (κ) agrees with typical *M. macrophylla* rather closely in the form of the leaf and stipules and in the structure and pubescence of the corolla. Both collections were made in the Lushai Hills in Assam, and I have no doubt that this form is a variant of the species. This variation is comparable to *M. philippica* var. *aurorae* from the Philippine Islands and *M. whitei* S. Moore (*Brass 11682* [A]) from Dutch New Guinea. In the latter collection two specimens are mounted on the same sheet. Both specimens, probably from the same plant, are long-styled forms, the one at the top bearing large, petaloid calyx lobes.

6. *Mussaenda treutleri* Stapf, Bot. Mag. 135: pl. 8254. 1909. (TYPE: *Wallich 6250E*). FIG. 1, l, r.

M. frondosa var. *grandifolia* Hook. f. Fl. Brit. India 3: 90. 1880.

M. macrophylla sensu Kurz, Forest Fl. Burma 2: 57. 1877, non Wall. in Roxb. Fl. Indica ed. Carey & Wall. 2: 228. 1824.

Shrub 2–3 m. in height, sometimes scandent in its native habitat. Leaves ovate or elliptic-ovate, 7.5–23 cm. long, 3–14 cm. broad, short acuminate, cuneate, scantily pubescent on both surfaces, hirsute on the 8–10 pairs of veins beneath; petioles 0.8–5 cm. long, stout, hairy. Stipules broadly ovate or triangular-ovate, 1.1–1.4 cm. long, 5.5–10 mm. broad at the base, bifurcate from the apex for about 1/3 their length, densely hairy on the outer surface, less hairy within with numerous glands in two ascending groups. Inflorescence a terminal, trichotomously branching, compact, many-flowered, pubescent, corymbose cyme; bracts and bracteoles lanceolate, 5–10 mm. long, hairy, bracteoles trilaciniate, broader at the base. Flowers heterostylous, on stout, pubescent pedicels much shorter than the ovaries. Calyx lobes linear or subulate, 4.5–12 mm. long, 0.7–1 mm. broad at the base, tapering toward the apex, hairy on the outer surface especially along the midrib and the margins, glabrous within with two pairs of glands at the base of each; petaloid sepal ovate or oblong-ovate, 4.7–14.5 cm. long, 2.5–10 cm. broad, short acuminate, short cuneate at base, glabrous on both surfaces except on veins below or scantily hairy on the upper surface and hirsute below, hairs denser on veins, “petiole” 2.5–2.8 cm. long, scantily pubescent or hirsute. Corolla tube 2.9–3 cm. long, appressed pubescent on the outer surface, hairy within at the throat as far as the bases of the anthers, and tufted at the mouth, hairs long in both the long-styled and short-styled forms, less dense in the former, below the anthers the hairs shorter and scantier extending about 1/4 the length of the corolla tube from the glabrous base; corolla lobes 5.2–6 mm.

long, 4 mm. broad, ovate, caudate-apiculate, hairy on the outer surface, papillate within. Stamens with short epipetalous filaments, inserted 1/2 way on the tube in long-styled forms and 3/4 way up in short-styled forms; anthers 4–5.5 mm. long, linear, dorsifixed, introrse, faintly bifid at the base. Ovary broadly fusiform, 2.5–4 mm. long, hairy, 2-locular, with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 2.7 cm. and 4 mm. long respectively in long-styled forms, 1.4 cm. and 4.5 mm. long in short-styled forms. Berry globose, 1–1.3 cm. long and as broad, glabrescent, with calyx lobes deciduous; seeds minute, reticulate, broadly ovate or pyriform, 1.1 mm. long, 0.8 mm. broad with a conspicuously protruding hilum, testa with 2–10 foveae in each areole.

ILLUSTRATIONS. Wallich, *Pl. As. Rar.* 2: *pl.* 180. 1831; Lindley, *Bot. Reg.* 32: *pl.* 24. 1846; Paxton, *Mag. Bot.* 12: 197. *pl. C.* 1846; Stapf, *Bot. Mag.* 135: *pl.* 8254. 1909.

DISTRIBUTION. This species grows in the tropical Himalayan range of hills in India, Sikkim, Bhutan, and Khasia, at elevations between 650 and 2200 meters above sea level. It was first collected by Wallich in the mountains of Nepal and later by Hooker in Khasia and Sikkim. It is said to flower during the rainy season and fruit in the winter months. It has been collected in flower in June and July and in fruit in December.

India. KUMAUN: Almora Div., *Biskam* 2298 (NY). NEPAL: Wallich [6250 *E*], 1821 (K-lectotype), *Herb. Meisner, Basil*, 1853 (NY). BHUTAN: Trongsa to Tsanka, *Gould* 629 (K). KHASIA: *Hooker & Thomson* 20 (K). SIKKIM: *J. D. Hooker* 20 (GH, K, NY); *Treutler* 6500 (K-syntype); Darjeeling, *Gamble* 3758A (K), 9565 (K).

The type specimens of this species come from the original collection of Wallich from Nepal in 1821 and Treutler's collection from Sikkim Himalaya in 1874. *Wallich* 6250*E* is selected as the lectotype. The species was introduced into cultivation by Knight and Perry about 1840 as a form of *Mussaenda frondosa* from Nepal and was confused with *M. macrophylla* and figured as such by Wallich, Lindley, and Paxton until Sir Joseph Hooker pointed out that it was distinct and treated it in his *Flora of British India* as *M. frondosa* var. *grandifolia*. Stapf elevated the variety to the rank of species.

All figures match well with the species. Wallich figured a short-styled form and showed the characters of the stipules and sepals clearly, while Paxton and Stapf figured long-styled forms. Heterostyly is obvious in this species. Throat hairs are long and tufted in the mouth in both types of flowers but less dense in the long-styled forms. *Mussaenda treutleri* is distinguished from *M. macrophylla* by the large, ovate or elliptic-ovate, scantily pubescent leaves, cuneate from a broad base; the broader, triangular-ovate stipules; the linear or subulate sepals, hairy along the midrib on the outer surface and setose ciliate at the margin, glabrous within with two pairs of glands at the base of each; the corolla tube appressed-pubescent on the outer surface, lobes caudate-apiculate (recognized in the unopened flower by recurved tips at the top); and the glabrescent fruits

and larger seeds. *Mussaenda treutleri* is distinguished from other species by its large leaves and stipules; its linear, setose-ciliate sepals; its ovate, caudate-apiculate petals; and its globular, glabrous berries and larger seeds with 2–10 foveae in each areole of the testa.

7. *Mussaenda incana* Wall. in Roxb. Fl. Indica ed. Carey & Wall. 2: 229. 1824; Hook. f. Fl. Brit. India 3: 87. 1880 (TYPE: *Wallich 6256*).
FIG. 1, c; FIG. 3, d–f.

M. pubescens sensu Buch.-Ham. in Wall. Cat. 6257. 1832, non Ait.

Small, erect shrub less than 1 m. tall; stems simple, terete, pubescent, not commonly branched except at the top before flowering, internodes 6–11 cm. long. Leaves ovate-oblong, 3.5–11(–18) cm. long, 1.7–6(–10) cm. broad, tapering, acute or acuminate, the base acute or rounded, inequilateral; hairy above, villous and white beneath with 6–14 pairs of arcuate, parallel, lateral veins, prominent on the lower surface; petiole stout, 2–5 mm. long, densely hairy. Stipules triangular, tapering from a broad base, 7–9.5 mm. long, 4.5–6 mm. broad, erect, bifurcate from apex for about $1/3$ – $1/2$ their length, hairy on the outer surface, within glabrous with a few glands in two groups at the base, 6–19 glands to each group. Inflorescence a terminal, small, subsessile, few-flowered di- or trichotomous cyme, the terminal pair of leaves also producing axillary, long-stemmed cymes extending beyond the primary one, exceedingly hairy; bracts and bracteoles linear, subulate and hairy. Flowers heterostylous, subsessile or on very short, stout, hairy pedicels. Calyx lobes 4–5.5 mm. long, 0.8–1 mm. broad at the base, filiform, hairy outside, glabrous inside with a pair of glands at the base of each; petaloid sepal milky white, 5–7 cm. long, 2.8–3.6 cm. broad, ovate or broadly oblong, acute, cuneate at base, glabrous or hairy on the upper surface, pubescent below, 5- or 7-veined, “petiole” 2.5 cm. long, densely hairy. Corolla tube 2–2.3 cm. long, hairy on the outer surface, hairs scanty within, long, slightly shorter (1–1.2 mm. long) in long-styled flowers but tufted at the mouth in both forms; below the anthers hairs shorter, scantier, extending as far as $1/12$ – $1/4$ the length of the tube from the base; corolla lobes 4.5–5.5 mm. long, 2.5–3.2 mm. broad, ovate-lanceolate, acuminate, sometimes almost caudate, hairy on the outer surface, papillate within. Stamens with short filaments, epipetalous $1/2$ way on the tube in long-styled forms and $3/4$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 3.7–4.3 mm. long, bilobed at base. Ovary broadly cup-shaped, 3–3.2 mm. long, hairy, 2-locular, with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 2 cm. and 2.5 mm. long respectively in long-styled forms, 1.1–1.3 cm. and 2 mm. long in short-styled forms. Berry globose, 1.3–1.5 cm. long, hairy at first, later glabrous, nectariferous disc small with subpersistent calyx segments; seeds brown, numerous, minute, ovate, reticulate, 0.9–1.16 mm. long, 0.83 mm. broad, testa with 2–7 foveae in each areole.

DISTRIBUTION. This species occurs in the tropical Himalayan range between 600 and 1200 meters elevation, extending from Nepal (where the type was collected), through Sikkim, the Khasia mountains as far as Assam to the east, and southwards to Orissa. It has been collected in flower in July, in fruit in October.

India. NEPAL: *Wallich 6256* (K-holotype). SIKKIM: Darjeeling, *Gamble 840A* (K); *Herb. Griffith 2781* (K), Kew Distribution 1861-2. ASSAM: Khasia Mts., *Hooker & Thomson* (C, K, NY). ORISSA: Chota Nagpore, *Clarke 20344, 20455A* (K); Cult. Bot. Gard. Calcutta, *Voigt 136* (C).

This species seems to be allied to *Mussaenda hirsutissima* in many respects. The form and pubescence of the leaves and stem, the size of the fruits and seeds are characters common to both species. It differs, however, in the habit; the subsessile, small, few-flowered inflorescence; and the smaller stipules, flowers, calyx and corolla lobes. Heterostyly is demonstrated in the species; the throat hairs in the long-styled forms are slightly shorter and scantier than in the short-styled forms.

Mussaenda incana is distinguished by its short-petioled, hairy, ovate leaves; subsessile, few-flowered, densely hairy cymes; triangular-acuminate stipules glabrous within and with few glands; small linear-subulate calyx lobes glabrous within and with one pair of glands; short corolla tube; small lance-ovate corolla lobes; and large fruits and seeds.

8. ***Mussaenda hirsutissima*** (Hook. f.) Hutch. ex Gamble, Fl. Madras 2: 610. 1921 (TYPE: *Herb. Wight 1268*). FIG. 1, m; FIG. 3, m-o.

M. frondosa var. *hirsutissima* Hook. f. Fl. Brit. India 3: 90. 1880.

Large climbing shrubs; stems roughly hirsute-pilose. Leaves opposite, lamina ovate-elliptic, rarely elliptic-lanceolate, 4.5-11 cm. long, 2.5-5 cm. broad, acuminate, cuneate or rounded at base, shaggily hirsute on both surfaces, primary lateral veins 7-9 pairs, prominent on the lower surface; petiole 0-5 mm. long, densely hirsute. Stipules 10-12 mm. long, 4.5-8 mm. broad at the base, bifurcate from apex $1/2$ - $2/3$ their length, lobes spreading, hairy on the outer surface, glabrous or scantily pubescent within, usually hairy at the base within and among the numerous glands occurring in two groups, vascular strands about 5-7 pairs, branched. Inflorescence a terminal, close, hairy, dichotomously branched, few-flowered cyme; bracts and bracteoles 1-1.5 cm. long, lanceolate, hairy, bracteoles trifid at apex, broader at the base. Flowers large, heterostylous, on stout, densely hairy pedicels shorter than the ovaries. Calyx lobes 6.5-13 mm. long, 1-1.2 mm. broad, lanceolate, hirsute on the outer surface, glabrous or scantily pubescent within with a tuft of hairs and 1-3 pairs of glands at the base of each; petaloid sepal 5.5-10 cm. long, 2.7-6 cm. broad, ovate-elliptic, short acuminate, cuneate or even cordate, scantily pubescent or hirsute on both surfaces, hairs denser on veins below, "petiole" 1.7-3 cm. long, hirsute. Corolla tube 2.3-3.2 cm. long, hairs on the outer surface horizontally spreading, longer toward the broader end, hairy within at the mouth

and throat as far as the bases of the anthers, densely so in short-styled forms and scantily hairy in long-styled forms, hairs in both forms long (1.5 mm.) and tufted at the mouth, below the anthers the hairs shorter, linear, and scantier, extending as far as the base in long-styled forms and to $1/4$ the length of the tube from the base in short-styled forms; corolla lobes broadly ovate, 5–12 mm. long, 4.5–8 mm. broad, acuminate, hairy on the outer surface, papillate within. Stamens with short filaments inserted midway on the tube in long-styled forms and $3/4$ to $4/5$ way up in short-styled forms; anthers 4.2–6.5 mm. long, linear, dorsifixed, introrse, bilobed at the sterile base. Ovary 2.7–4.5 mm. long, turbinate, hairy, 2-locular with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 2.35 cm. and 1.8 mm. long respectively in long-styled forms, 1.1–1.5 cm. and 2.5–3.5 mm. long in short-styled forms. Berry globose, 1.2 cm. long, and about equal in diameter, sparingly hirsute, calyx teeth deciduous; seeds minutely reticulate, triangular-ovate or oval, 1.1–1.16 mm. long, 0.87 mm. broad, some smaller (0.67 mm. by 0.5 mm.), testa with 4–8 foveae in each areole.

DISTRIBUTION. This species occurs along the Western Ghats in India confining itself to higher elevations (1200 to 2400 meters), extending from Mysore through the Nilghiri and Pulney hills to Madura, Tinnevely, and Travancore. It has been collected in flower in March, April, May, and December; in fruit in January and June.

India. COONOR: Nilghiri hills, *Bourne* (K); *Gamble 11393* (K); *Prain* (A), 1899; *Clarke 10704A* (K); *Cole 6* (K, NY); Mount Nilghiri & Kurg, *Thomson 9* (GH, K). KODAIKANAL REGION: Pulney Hills, *Anglade* (A); *Bourne 50* (K). MADURA: *Jacob 17568* (K). TRAVANCORE: Kovilur, Pambadi Shola, *Barnes 120* (A). Ind. Orient: *Herb. Wight 1306*, in part (GH), *1305* (C, GH, NY); *Herb. Wight 1268* (K-lectotype; NY).

Heterostyly may be seen clearly in this species. In both short-styled and long-styled forms the throat hairs are long and tufted at the mouth, but less dense in the long-styled form. Below the anthers the hairs are shorter and scantier extending through the entire length of the corolla tube in the long-styled forms as in *Mussaenda roxburghii*, but only $3/4$ the length in short-styled forms, the base being glabrous. Another character present also in *M. roxburghii* is tufted hairs at the base of the calyx lobes within. The collection *Herb. Wight 1306* (GH) has two specimens mounted on it. The branch at the top is *M. hirsutissima*, while that below is *M. laxa*. The leaves of the Anglade collection from the Pulney Hills are less hairy than those of other collections. *Barnes 120* is remarkable for its large flowers, stipules, and long, almost lanceolate filiform calyx lobes.

Mussaenda hirsutissima is distinguished by its shaggy-pilose stems and leaves, the latter almost sessile, ovate-elliptic, and more or less rounded at the base; its larger flowers with rather horizontally placed hairs on the outer surface of the corolla tube, its throat hairs long and tufted within at the mouth in both forms, hairs less dense in the long-styled forms; and its larger seeds triangular-ovate and of two different sizes.

9. **Mussaenda roxburghii** Hook. f. Fl. Brit. India 3: 87. 1880 (TYPE: *Wallich 6252C*). FIG. 1, a, b; FIG. 3, a-c.

M. corymbosa sensu Wall. Cat. 6250C (in part), 6252A, B (in part), C, & D (in part). 1832, non Roxb.

M. frondosa sensu Wall. Cat. 6250E. 1832, non L.

M. pubescens sensu Wall. Cat. 6257B. 1832, non Ait.

M. corymbosa sensu Kurz, Forest Fl. Burma 2: 58. 1877, non Roxb.

Large, erect, spreading shrub, 2–9 m. tall with stems almost glabrous to densely hirsute. Leaves oblong-lanceolate, ovate or elliptic, 9–28 cm. long, 3.5–9.8 cm. broad, acuminate, cuneate at base, glabrous or minutely pubescent on the upper surface, pubescent on the lower surface and hirsute on veins, or densely hairy throughout, with 7–14 pairs of lateral veins; petioles 0.5–2.5 cm. long and hirsute. Stipules triangular-lanceolate, 7.5–23 mm. long, 4–9 mm. broad at the base, bifurcate from apex $1/3$ – $1/2$ their length, hairy on the outer surface, hairs concentrated on the body with the margin glabrous, hairy within at the base and between the few or many glands occurring in two groups, the lobes straight. Inflorescence a terminal, pubescent, many-flowered, somewhat capitate cyme; bracts and bracteoles small, lanceolate, hairy; bracteoles trilacinate into short or long, linear segments, broader at the base. Flowers heterostylous on stout pedicels as long as or shorter than the ovaries. Calyx lobes lance-filiform, 6–12 mm. long, 1 mm. broad, hairy on the outer surface, glabrous within, usually with a tuft of hairs and 1–3 pairs of glands at the base of each; petaloid sepal white, oblong-lanceolate, 4–11.5 cm. long, 2–5.8 cm. broad, short-acuminate, cuneate, glabrous above, minutely pubescent and hirsute on veins below; “petiole” 1.5–4.5 cm. long, hairy. Corolla tube green, 2.4–2.8 cm. long, narrow, silky, appressed pubescent on the outer surface, within hairy throughout the entire length with a tufted ring of hairs at the base, hairs above the bases of the anthers longer (1.5 mm. long) in the short-styled than in the long-styled forms, tufted at the mouth, hairs scantier and shorter below the anthers; corolla lobes yellow to orange, oblong-lanceolate, 4–8 mm. long, 2–2.5 mm. broad, acuminate, filiform at the apex, pubescent on the outer surface, papillate within. Stamens with short filaments, epipetalous on the tube about $2/5$ – $3/5$ way up in long-styled forms and $3/5$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 5–5.5 mm. long, acute, bilobed at base. Ovary 2.5–4.5 mm. long, hairy, soon glabrous, 2-locular with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 2 cm. and 2.5–3 mm. long respectively in long-styled forms, 1.25–1.35 cm. and 2.5–4 mm. long in short-styled forms. Berry globular, about 0.8–1.3 cm. long, glabrous, with persistent calyx lobes; seeds minute, numerous, reticulate, 0.6–0.67 mm. long, 0.53–0.56 mm. broad, oblong, oval or triangular-ovate, albuminous, testa with 4–10 foveae in each areole.

DISTRIBUTION. This species occurs in the tropical Himalayan range of hills up to an elevation of about 1500 meters above sea level, extending from Nepal through Sikkim, Bhutan, Khasia, E. Bengal, and Assam to

Arracan and Upper Tenasserim in Burma. It has been collected in flower from April to September, and in November; in fruit in September and October.

India. NEPAL: *Wallich* (c); *Clarke* 26486 (κ). EAST HIMALAYA & SIKKIM: Chungthan to Singhik, *Biswas* 6968 (A); Simulbari-Tindharia, *Biswas* 8697 (LWG), *Biswas s. n.* (A); *J. D. Hooker* 18 (κ, GH); *Herb. Kuntze* 665 (NY); Darjeeling, *Gamble* 3760A (κ), 3761A (κ); *Cowan Imp. For.* 24466 (US); *Herb. Griffith* 2780 (c, GH, κ); *Herb. Kuntze* 6643 (NY). BHUTAN: Kalimpong, *Gamble* 10476 (κ). KHASIA: Mairong, *Schlaginweit* 507 (GH); *Hooker & Thomson* 18 (c, NY); Mungklow, *Clarke* 44821B (US); *Hooker & Thomson* 19 (GH, κ); Shillong, *Clarke* 44321A (κ). SILHET: *Wallich* 6252C (A—photograph of lectotype in κ), *Wallich* 6252G (c). EAST BENGAL: Chittagong, *Hooker & Thomson* 18, in part (κ), *Herb. Griffith* 2780 (c, κ). ASSAM: Cachar, *Keenan*, 1873 (κ); Manipur, *Meebold* 6287 (BSI); Kala Naga Hills, *Watt* 7322 (κ); Upper Assam, *Jenkins* 496 (κ); Namchik River Valley, *Juan* 228 (US); 19 miles from Ledo, *Juan* 178 (A); Barni Hat, *Ruse* 96 (A); Kamakhya, Kamrup, *Nayar* 51288 (LWG); *Chatterjee* (A, BSI, GH); Jacoba, *Prain's Collector* 43 (A); Tura Mountain, *Parry* 846 (κ). **Cultivated:** Calcutta Bot. Gard., *Wallich* 6250C (in part), 6252A, 6252D (in part) (A—photographs of syntypes in κ), *Voigt* (c), 136 (A, c, US), 360 (A, c); without locality, *Mus. Bot. Haun.* 11538 (c, US). Pennsylvania, Longwood Gard., *Wikoff* 1382 (GH).

Hooker's description of this species is based on Wallich specimens labeled *Mussaenda corymbosa* (see synonymy above), his own collections 18 and 19 from Sikkim and Khasia, *Herb. Griffith* 2780, and several other collections. Of these, one sheet of *Wallich* 6252C (κ; photograph, A), from Silhet, is most characteristic and is chosen as the lectotype. In his discussion he remarks that this is "not the same plant described under that name by Roxburgh in the *Flora Indica*, which is stated to be native of Ceylon and Malabar." No plant answering Hooker's description nor that by Roxburgh has been collected from Ceylon and Malabar. Further, it is very unlikely that the distribution of this species extended so far without a trace of it among the collections from the Western Ghats.

Hooker distinguished two varieties: var. 1, representing the typical *M. roxburghii* with nearly glabrous branches, oblong-lanceolate leaves, and silky bracts and flowers; and var. 2, from higher elevations and possessing more or less villous branches, large, elliptic and hairy leaves, and villous bracts and flowers. The second variety is represented by Clarke's and Hooker's collections from Khasia and Parry's collection from Assam. Clarke distinguished this from *M. incana* "as sepals persistent a species next *incana*. It has spreading hairs on the stem, upper surface of leaves glabrous. Therefore it is not *incana*." Another worker, with the initials "DN,"² added to the same specimen in Oct. 1902, "I see no difference of importance between this and the Khasia specimens of *M. Roxburghii* Hook. f. with hirsute branches." I am inclined to agree with the latter statement as the sepal, petal, and internal characters of the flower are the same in both varieties.

² According to Dr. R. C. Foster, "DN" represents the initials of Lady Dorothy Neville, a great horticulturist of this period.

The collection *Parry 276* (κ) from the Lushai Hills, Assam, is of particular interest. The leaves are over 30 cm. long, the stipules broadly ovate, 17.5 mm. long, cordate at base, glabrous within, not bifurcate at apex, also the hairs in the corolla tube not extending to the base, characters common to *M. corymbosa*. In the leaf and sepal characters *Parry 276* resembles *M. roxburghii*. Another collection, *Kingdon-Ward 8455* (κ), also from Assam at an altitude of 1500 m., resembles *M. treutleri* in all the external characters, such as the form and pubescence of leaves, inflorescence, and the internal hairs in the corolla tube, but differs from it in characters of the sepal and stipules, which are those of typical *M. roxburghii* with the characteristic tuft of hairs at the base of the sepal.

Mussaenda roxburghii is distinguished from other species by its compact or almost capitate cymes; pubescent and filiform calyx lobes, glabrous within with a tuft of hairs at the base of each; narrow, silky corolla tube, hairy within and with a tufted ring of hairs at the base, the lobes caudate; globose and glabrous fruits with persistent calyx segments; and leaves glabrous on the upper surface.

10. ***Mussaenda corymbosa*** Roxb. Fl. Indica ed. Carey & Wall. 2: 226. 1824, non Kurz, Forest Fl. Burma 2: 58. 1877; Hook. f. Fl. Brit. India 3: 91. 1880 (TYPE: *Wallich 6252D*, in part).

FIG. 1, d, e, q.

Stout, rigidly erect, branching shrub with glabrous stems. Leaves opposite, ovate- or oblong-lanceolate, 8–16.5 cm. long, 3.5–8 cm. broad, short acuminate, cuneate at the base, glabrous on the upper surface, minutely puberulous below, with 9–14 pairs of lateral veins conspicuous on the lower surface and pubescent; petioles stout, 0.3–4.2 cm. long, glabrous or pubescent. Stipules broadly oblong or triangular ovate, 13–18 mm. long, 7–12 mm. broad at the base extending to within the petioles, hairy along the midline on the outer surface, glabrous within with numerous glands in a continuous band at the base, apex abruptly acuminate terminating in an acute point or bifurcate at the tip only, margin entire or somewhat undulate, vascular strands many, parallel and branched. Inflorescence a terminal, compact, many-flowered, glabrous, di- or trichotomous cymose corymb; bracts and bracteoles lanceolate, glabrous, bracteoles becoming somewhat ovate and larger lower down. Flowers heterostylous on stout, glabrous pedicels shorter than the ovaries. Calyx lobes erect, filiform, 3.5–8.5 mm. long, 0.8–1 mm. broad at the base, glabrous on both surfaces with 2 or 3 pairs of glands at the base of each within; petaloid sepal white, 5–6.5 cm. long, 2.5–3.7 cm. broad, ovate or oblong-elliptic, glabrous on both surfaces except on veins below, acute at apex, narrowed at base, 5- or 7-veined “petiole” 3–3.5 cm. long, minutely pubescent. Corolla tube 2.2–2.6 cm. long, glabrous on the outer surface, hairy within, tufted at the mouth, hairs in the throat long and dense in both long-styled and short-styled forms, below the anthers the hairs shorter

and scantier up to $1/5$ – $1/4$ the length of the tube from the base; corolla lobes deep, bright orange, greenish underneath, fleshy, ovate-lanceolate or oblong-ovate, 3.5–4 mm. long, 1.7–2.4 mm. broad, minutely pubescent along the midline of the outer surface, papillate within. Stamens with short filaments, epipetalous about $1/2$ way up on the tube in long-styled forms and $2/3$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 4.5–5.3 mm. long, straight, blunt at the apex, faintly bifid at the base. Ovary 2.3–4.5 mm. long, broadly obconic-fusiform, glabrous, 2-locular with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 1.65–2.05 cm. and 2–3.5 mm. long respectively in long-styled forms, 1.25 cm. and 3 mm. long in short-styled forms. Berry (immature) oval, 7–8 mm. long, glabrous with numerous seeds embedded in a fleshy pulp, calyx lobes subpersistent, seeds (immature) reticulate, 0.43–0.46 mm. long, 0.33–0.39 mm. broad, oblong or broadly triangular ovate, testa with 4–7 foveae in each areole.

ILLUSTRATION. Roxburgh's Fl. Indica drawing No. 1220 in Kew (Kew Bull. 1957: 361), not seen.

DISTRIBUTION. The collections of *Mussaenda corymbosa* made so far have been from the Bengal-Calcutta area only. The localities of this species were erroneously reported by Roxburgh as Ceylon and Malabar. Hooker (1880) says that "no Ceylon or Malabar plant known to me answers to his [Roxburgh's] description or to a figure of a Calcutta Garden plant which bears this name in a collection of drawings at Kew made for Dr. Roxburgh." I have not come across this plant in Ceylon either, nor has it been collected from Malabar. It flowers during the rainy season.

India. BENGAL: *Herb. Griffith* 2779/1 (GH); Calcutta, Galathea Expedition (1845–47), *Kamphovener* 954 (c); *Herb. Didrichsen* (c); Hort. Bot. Calcutta, *Wallich* 6252D (A—photograph of lectotype at K; GH—isotype); H[ort]. B[ot]. Serampore [Calcutta], *Wallich* 6252 ex *Herb. Benth* (NY—isosyntype); Bot. Gard. Calcutta, *Wallich* (GH); cult. Hort. Bot. Calcutta (NY).

Mussaenda corymbosa is allied to *M. roxburghii* Hook. f., from which it differs in its large, persistent stipules and in having all parts of the plant glabrous. Its affinity to *M. keenanii* Hook. f. is closer still. The large stipules, compact, glabrous inflorescence, and filiform calyx teeth are characters common to both, in addition to the leaves with the upper surface glabrous. Heterostyly is demonstrated in the species. Kamphovener's collection bore only a cluster of miniature berries along with short-styled flowers. Throat hairs in both the long-styled and short-styled forms are long and of equal length, a character of *M. frondosa*.

The species is distinguished from others by the glabrous stems, leaves and inflorescences; the large persistent stipules, glabrous within and with numerous glands in a continuous band at the base; glabrous, filiform calyx lobes with two or three pairs of glands at the base of each; narrow corolla tube, glabrous on the outer surface with ovate-lanceolate, non-appendaged lobes; and glabrous, oval berries.

11. *Mussaenda keenanii* Hook. f. Fl. Brit. India 3: 87. 1880 (TYPE: *Keenan*, 1874). FIG. 1, p.

Herbaceous shrub, stems glabrous or scantily appressed pubescent, internodes 3.7–5.7 cm. long, stout. Leaves petioled, 9.5–23.5 cm. long, 4.7–11.3 cm. broad, broadly elliptic or oblanceolate, coriaceous, acuminate, rounded or narrowing towards the base, glabrous and shining above, densely tomentose or hirsute on veins below, the 9–12 pairs of lateral veins arcuate and very prominent on the lower surface; petioles 0.5–3 cm. long, stout, hirsute or appressed pubescent. Stipules broadly ovate, acuminate, 1.6 cm. long, 7 mm. broad at the base, many veined, hairy along the midline and the margin of the outer surface, glabrous within, faintly bifid at the apex, bases extending to within the petioles. Inflorescence terminal, glabrous, the almost capitate cymes about 5 cm. in diameter, on stout peduncles; flowers glabrous, on stout, glabrous pedicels shorter than the ovaries. Calyx lobes linear-filiform, 0.8–1.2 cm. long, 1 mm. broad at the base, scantily pubescent on the outer surface and along the margin, glabrous within, bases fused to form a short tube. Corolla tube about 2–2.5 cm. long, puberulous towards the top, lobes lanceolate, 5 mm. long, 2.2 mm. broad, fleshy, minutely puberulous on the outer surface, papillate within. Ovary about 3 mm. long, broadly fusiform, glabrous. Berry ovoid, 8 mm. long, glabrous, with persistent calyx segments; seeds minute, numerous, reticulate, 0.36–0.46 mm. long, testa with 2–5 foveae in each areole.

DISTRIBUTION. This species, occurring on the margins of flats, was collected by Keenan, in Cachar in 1874, and in Chittagong by Hooker.

India. Cachar, *Keenan* (κ-holotype); up to 300 m. elevation, Chittagong, *J. D. Hooker & T. Thomson* 18, in part (κ).

This species, *Mussaenda keenanii*, was noted by Hooker as “a remarkable plant, described by its finder as herbaceous, large and robust in all its parts, and flowering later than the other Cachar species.” Hooker’s collection from Chittagong has two specimens mounted on the same sheet, both with fruits. The top specimen collected from Seetakoond on Jan. 5, 1851, is *Mussaenda roxburghii*, while the specimen below, marked “Flagstaff 228” and collected on Dec. 29, 1850, has the characters of *M. keenanii*: leaves glabrous on the upper surface with 12 pairs of lateral veins, glabrous fruits with persistent calyx, smaller seeds and smaller number (2–5) of foveae in the areoles of the testa.

Mussaenda keenanii is allied to *M. roxburghii* in its almost capitate, glabrous cymes, filiform, crinite calyx teeth, and glabrous berries with persistent calyx segments, but differs from it in the glabrous stems, corolla tube, and the smaller seeds with fewer foveae in the areoles of the testa. I see no relationship to *M. incana* except in the persistent calyx.

From the other mussaendas, *M. keenanii* may be distinguished by its large, thick, leathery leaves, glabrous on the upper surface and tomentose beneath; its glabrous and almost capitate cymes; its glabrous corolla tube; and its berries with persistent calyx segments.

12. *Mussaenda intuspilosa*, sp. nov.

Frutex, caulibus et ramis glabris. Folia oblongo-lanceolata, acuminata, basi cuneata, supra glabra, subtus minute puberula, venis lateralibus 8–10 paribus; stipulae triangulari-lanceolatae, apice bifidae, extus basi et secundum medias pilosae. Cyma terminalis, trichotoma, diffusa. Flores heterostyli; calycis lobi lanceolati, acuminati, glabri vel pubescentes; corollae tubus 2.5–3 cm. longus, extus pubescens, intus totus pilosus vel pubescens et basi pilis penicillatis; corollae lobi lanceolati, acuminati; antherae lineares; bacca ovoidea calycis segmentis deciduis coronata, semina numerosa, minuta, reticulataque.

Shrub about 2.5 m. high with glabrous stems and branches. Leaves oblong-lanceolate or elliptic-lanceolate, 8.5–24 cm. long, 3–8 cm. broad, acuminate, cuneate at base, glabrous on the upper surface, minutely puberulous beneath with 8–10 pairs of lateral veins prominent on the lower surface; petiole 0.5–3 cm. long, glabrous or puberulous. Stipules triangular-lanceolate from a broad base, 6.5–8.5 mm. long, 3.5–6 mm. broad at the base, bifurcate at the apex, hairy at the base and along the middle on the outer surface, hairy within at the base and among the numerous glands. Inflorescence a terminal, glabrous or minutely appressed-pubescent, trichotomous, diffuse cyme; bracts and bracteoles small, lanceolate, glabrous or pubescent, bracteoles broader. Flowers heterostylous, on stout, glabrous or appressed-pubescent pedicels shorter than the ovaries. Calyx lobes five, lanceolate, 4.5–9 mm. long, 1–1.5 mm. broad, acuminate, glabrous or pubescent on the outer surface, within glabrous with one or two pairs of glands and a tuft of hairs at the base of each sepal; petaloid sepal ovate or elliptic-lanceolate, 6.5–10 cm. long, 4.5–6 cm. broad, short acuminate or acute, cuneate, glabrous on both surfaces, 5-veined, "petiole" 1.2–2.8 cm. long, minutely puberulous. Corolla tube 2.5–3 cm. long, glabrous or minutely pubescent outside, hairy inside from mouth to base of the tube; hairs long in both long-styled and short-styled forms, tufted only at the base; corolla lobes 5, lanceolate, 4.5–8 mm. long, 2–2.5 mm. broad, acuminate, glabrous on the outer surface and minutely papillate within. Stamens five, with short filaments, adnate to the corolla tube below the middle, $2/5$ way up in long-styled forms and $3/5$ way up in short-styled forms; anthers linear, dorsifixed, introrse, 5–6 mm. long, acute, bilobed at base. Ovary inferior, turbinate or globular, 3–4 mm. long, glabrous or minutely and scantily appressed pubescent, 2-locular, with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 2–2.35 cm. and 2–2.5 mm. long respectively in long-styled forms, 1–1.1 cm. and 3.5 mm. long in short-styled forms. Berry (immature) ovoid, 0.75–0.9 cm. long, 6 mm. in diameter, glabrous or pubescent, with a deciduous calyx; seeds minute, reticulate, 0.53–0.73 mm. long, 0.36–0.53 mm. broad, oblong or broadly ovoid, testa with 3–10 foveae in each areole.

DISTRIBUTION. *Mussaenda intuspilosa* grows at the edge of semiopen glades or on roadsides in dense, heavy jungle in Assam and Burma at an elevation of 200–300 meters above sea level. It has been collected in flower in July, August, and October; in fruit in December.

India. ASSAM: 23 mi. on Ledo Road, Namchik River Valley, *Belcher*, U.S.A. Typhus Comm. 953 (US). **Burma.** UPPER BURMA: 40 mi. n. of Myitkyina, Malihka, Nsop Zup, *McKee* 6242 (K); 26.2 mi. on Myitkyina-Sumpsabum Road, *Belcher*, U.S.A. Typhus Comm. 811-E (US); Clegg Hill Traverse, e. bank of Irrawaddy, *Belcher*, U.S.A. Typhus Comm. 111, Aug. 17, 1945 (US-holotype); *Belcher*, U.S.A. Typhus Comm. 869 (K); Katha District, Mohuyin Reserve, *Lace* 5318 (K). LOWER BURMA: Myawaddi to Kawkereik Hills, *Rock* 712, 714 (US).

These collections previously have been doubtfully assigned to *Mussaenda glabra* from which they differ in many respects: larger leaves; larger stipules glabrous or pubescent along the midline and base on the outer surface, pubescent within at the base with numerous glands; sepals larger, pubescent (*Lace* 5318, *Belcher* 953) or glabrous (*Belcher* 111, 869) on the outer surface, all glabrous within and carrying a tuft of hairs at the base of each, a character typical of *M. roxburghii*. Other characters of *M. roxburghii* are the pubescence of the corolla tube inside where hairs are long in both short-styled and long-styled forms and tufted at the base but not at the mouth. The species differs however, from *M. roxburghii* in the diffuse inflorescence, lanceolate sepals glabrous or minutely pubescent outside the corolla tube, and the calyx segments deciduous from the fruit. *Lace* 5318 is more pubescent than other collections; *Belcher* 953 from Assam differs slightly from the type in the longer corolla tube and banded glands at the base of the stipule. The collections of Rock from Lower Burma agree with the typical form in the leaf, stipule, fruit, and seed characters, though their petaloid sepals are somewhat lanceolate-elliptic and narrowed at both ends.

The species can be distinguished by the large elliptic-lanceolate leaves, triangular-lanceolate stipules with numerous glands, diffuse cymes, lanceolate sepals with a tuft of hairs at the base of each; corolla tube not tufted at the mouth, entirely hairy within and tufted at the base, and glabrous berries with deciduous calyx segments.

13. *Mussaenda parryorum* Fischer, Kew Bull. 1928: 274. 1928 (TYPE: *Parry* 359).

Scandent shrub, stems terete, brown, appressed-pubescent, internodes 2.5–6.5 cm. long, lenticellate, lenticels white. Leaves opposite, equal, elliptic-lanceolate, 8–15.5 cm. long, 3.5–7 cm. broad, acuminate, cuneate at base, scantily pubescent with long hairs on both surfaces and 7–9 pairs of arcuate, lateral veins prominent below; petiole 0.3–1.5 cm. long, appressed-pubescent. Stipules caducous, triangular-lanceolate, 4–6.7 mm. long, about 3.5–4 mm. broad at the base, hairy outside, bifurcate from apex for about 1/2 their length, lobes subulate, straight. Inflorescence a terminal, trichotomous, many-flowered, diffuse, pubescent, sessile cyme; bracts and bracteoles linear-ensiform, pubescent on both surfaces, 4–8 mm. long, bracteoles trilaciniate. Flowers short, on stout, pubescent pedicels shorter than the ovaries. Calyx lobes 3–4 mm. long, about 0.8 mm.

broad, linear-ensiform, pubescent on both surfaces, caducous; petaloid sepal white with green veins, 4.5–6.5 cm. long, 2.2–3.5 cm. broad, elliptic, acute, narrowed and tapering to base, puberulous on the upper surface, hirsute on veins below, 5-veined, “petiole” 1–1.2 cm. long, hirsute. Corolla tube 2.1–2.5 cm. long, hairy on the outer surface, probably hairy within, tufted at the mouth, lobes yellow, small, suborbicularly ovate or reniform, 2–3 mm. long, 3.5 mm. broad, apiculate, hairy outside, papillate within. Ovary turbinate, 3–4 mm. long, hirsute, style filiform, stigma bilobed, lobes emerging through the tuft of hairs at the mouth (long-styled form). Berry subglobose, 7–8 mm. long, scantily pubescent, lenticellate, calyx lobes deciduous; seeds few, minute, reticulate, black, about 80 to a berry, consisting of large and small seeds embedded in the soft pulp, larger seeds 0.9 mm. long, 0.77–0.83 mm. broad, testa with 5–18 foveae to each areole.

DISTRIBUTION. This species was collected in flower and fruit, Oct. 1927, at an elevation of 1500 meters above sea level. It has not been collected since.

India. ASSAM: N. Vanalaiphai, Lushai Hills, *Mrs. N. E. Parry 359* (κ-lectotype, in fruit; syntype, in flower).

The type collection consisting of two sheets, one in flower and the other in fruit, was available for examination. Fischer was of the opinion that *Henry 8270* from Hainan, China, is this species. *Mussaenda parryorum* is related to *M. pubescens*, but the two differ in the size of the leaves, number of lateral veins, size of fruits and seeds. The leaves of *M. pubescens* are smaller with 5–7 pairs of lateral veins, while those of *M. parryorum* bear 7–9 pairs and are more pubescent. The fruits of the former are larger and bear numerous, smaller seeds (0.77–0.8 mm. long). Further, the number of foveae in the areoles of the testa is 3–10 as against 5–18 in *M. parryorum*.

Mussaenda parryorum may be recognized by its elliptic-lanceolate, pubescent leaves and stems, sessile and diffuse cymes, smaller fruits, and larger and fewer seeds embedded in soft pulp.

14. *Mussaenda samana*, sp. nov.

FIG. 2.

M. frondosa L. var. *β. glabrata* sensu Trimen, Hand-book Fl. Ceylon 2: 324. 1894, non Hook. f.

M. glabrata sensu Alston in Trimen, Hand-book Fl. Ceylon 6: 150. 1931, non Hutch. ex Gamble.

Frutex scandens, caulibus et ramis longis tenuibus arcuantibus glabris. Folia oblonga vel obovato-elliptica, acuminata, utrinque glabra, venis lateralibus 5–9 paribus. Stipulae parvae, triangulares vel lanceolato-acuminatae, apice bifidae, extus pubescentes intus glabrae cum glandulis paucis. Cymae terminales dichotomae pauciflorae. Flores tenues heterostyli; calycis lobi parvi lanceolati, acuminati; corollae tubus 2.1–3.1 cm. longus, extus adpresso-pubescent, pili ad orem penicillati, lobi lanceolati



FIG. 2. *Mussaenda samana*: a, branch with inflorescence and petaloid sepals, $\times \frac{1}{2}$; b, stipule seen from adaxial surface, $\times 10$; c, calyx lobes from within, $\times 4\frac{1}{2}$; d, corolla lobe from within, $\times 4$; e, longitudinal section of a long-styled flower, $\times 2$; f, longitudinal section of a short-styled flower, $\times 2$; g, young, mature berries, $\times \frac{1}{2}$, all from *Jayaweera 46*.

acuminato-caudati; antherae lineares epipetalae; ovarium fere cylindricum sparsim et minute adpresso-pubescens; bacca ovoidea glabra segmentis deciduis calycis coronata, semina numerosa, minuta, reticulata et spinulosa. (FIG. 2.)

Shrubby climber about 6–10 m. high with long, slender, glabrous, arching stems and branches. Leaves oblong, elliptic or obovate-elliptic, 4–9.2 cm. long, 1.5–4 cm. broad, acuminate, cuneate at base, glabrous on both surfaces with 5–9 pairs of lateral veins, veins prominent below and minutely appressed pubescent; petiole 0.5–1 cm. long, minutely appressed pubescent. Stipules small, 3.5–5.5 mm. long, 2.7–3 mm. broad at the base, triangular or lance-acuminate, bifid at apex, appressed pubescent on the outer surface, glabrous within with few, large glands in two groups at the base. Inflorescence a terminal, diffuse, dichotomous, few-flowered, slender cyme; bracts and bracteoles minute or small, triangular or lanceolate, hairy outside, within glabrous with one or two pairs of glands at the base, bracteoles larger, 3.5–4.5 mm. long, trifid at apex, the midlobe longer than the lateral lobes. Flowers heterostylous, on stout, minutely appressed-pubescent pedicels longer than the ovaries. Calyx lobes 5, small, lance-acuminate or triangular-subulate from a broad base, 1.2–3.5 mm. long, 0.6–1.5 mm. broad at the base, appressed pubescent on the outer surface, within glabrous with 1 or 2 pairs of glands at the base of each; petaloid sepal white, elliptic or ovate, 5.5–8.5 cm. long, 3.7–5 cm. broad, acute or rounded at apex, base cuneate, glabrous on both surfaces or minutely pubescent on the lower surface or on veins only, 5-veined; “petiole” 1–2.5 cm. long and pubescent. Corolla tube 2.1–3.1 cm. long, appressed pubescent on the outer surface; hairs on the inner surface long, tufted at the mouth, dense at the throat and between the anthers in both short-styled and long-styled forms, below the anthers the hairs shorter and scantier, extending as far as $1/7$ – $1/5$ the length of the corolla tube from base; corolla lobes 5, orange, broadly lance-ovate, 5.5–7.5 mm. long, 3.5–5.5 mm. broad, acuminate, caudate, pubescent on the outer surface, papillate within. Stamens 5, with short filaments, adnate to corolla tube $3/5$ its length in long-styled forms and $2/3$ its length in short-styled forms, filaments free for a short distance (about 2 mm.) midway on the corolla tube; anthers linear, dorsifixed, introrse, 5.3–7 mm. long, subacute or rounded at apex, bilobed at base. Ovary inferior, 3.5–5.5 mm. long, somewhat cylindrical, scantily and minutely appressed pubescent, 2-locular with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 2–2.4 cm. and 2–3 mm. long respectively, in long-styled forms, 1.6–1.75 cm. and 4.5 mm. long in short-styled forms. Berry ovoid, 1.3–1.5 cm. long, 1 cm. in diameter, glabrous, calyx lobes deciduous; seeds minute, reticulate, spiny, oblong or irregularly triangular-ovate, 0.83–1.33 mm. long, 0.67–1 mm. broad; testa with 4–12 foveae in each areole.

DISTRIBUTION. This is an endemic species growing at Gilimale in the Ratnapura District in Ceylon at an elevation of 150 meters above sea level, extending on to the foot of Adam’s Peak or Samana Kande (elevation 1350 meters), a locality sacred to Buddhists all over the world because of a rock carving of a foot of Buddha at its summit. The vegetation in this area is transitional between the Tropical Wet Evergreen Forests and Subtropical Montane Forests with a rainfall of over 250 centimeters a year. Species characteristic of this type of jungle are *Celtis cin-*

namomea Lindl., *Calophyllum calaba* L., *Garcinia echinocarpa* Thw., *Terminalia parviflora* Presl, *Kurrimia zeylanica* Arn., *Doona gardneri* Thw., *Semecarpus nigroviridis* Thw., *Myristica malabarica* Lam., and *Diospyros sylvatica* Roxb. *Mussaenda samana* flowers and fruits between September and January, the less rainy months of the year.

Ceylon. RATNAPURA DISTRICT: Gilimale, *Jayaweera* 46, Jan. 24, 1961, holotype (A), *Jayaweera* 43, 47 (A); Foot of Adam's Peak, *Jayaweera* 42, 44 (A).

This species was referred to *Mussaenda frondosa* var. *glabrata* by Trimen (1894), but it differs from that plant in its glabrous stems and leaves, smaller stipules, longer, lance-ovate corolla lobes, and larger fruits and seeds. The only common character is the spininess of the seed. It resembles *M. glabra* to a certain extent but differs from it in the large spiny seeds and in having in the throat of the corolla tube of long-styled forms long hairs which are tufted at the mouth of the tube, in contrast to *M. glabra* with its smooth seeds and short hairs in the corolla tube of the long-styled forms. This species stands distinct from *M. frondosa* var. *glabrata* and from *M. glabra* but is related to both of them. I describe this species as new, not only because of its distinctive characters, but also because of its isolation. Trimen says in reference to this, "Var. β , which looks quite distinct, is perhaps the *M. corymbosa* of Roxb. which he states (Fl. Ind. i. 556) to be a native of Ceylon, or possibly *M. glabra*, Vahl, which has a wide Malaya and Burma distribution but is not recorded for Peninsular India in Fl. B. Ind."

Mussaenda samana is easily distinguished from other species of the genus by its glabrous stems and leaves; small stipules; slender, few-flowered terminal cymes; small calyx lobes; lance-ovate, acuminate corolla lobes; throat hairs long in both long-styled and short-styled forms; glabrous berries with dehiscent calyx; and large, spiny seeds.

15. ***Mussaenda glabra*** Vahl, Symb. Bot. Pl. 3: 38. 1790; Hook. f. Fl. Brit. India 3: 90. 1880 (TYPE: *Vahl*). FIG. 1, f-j; FIG. 3, g-i.

M. frondosa sensu Wall. Cat. 6250B & E (both in part). 1832, non L.

M. setulosa Klotzsch, Ber. Akad. Wiss. Berlin 1853: 499. 1853.

M. penangensis Miq. Fl. Ned. Indië 2: 214. 1857.

Rambling or climbing shrub with almost glabrous branches. Leaves elliptic, oblong or elliptic-lanceolate, 5–14 cm. long, 1.6–5.5 cm. broad, acuminate, cuneate, acute or obtuse at base, usually glabrous on both surfaces and minutely pubescent on veins below or on both surfaces, or on the lower surface only, with 4–10 pairs of lateral veins; petioles 0.4–2.5 cm. long, glabrous or pubescent. Stipules triangular or lanceolate, 2.7–8.5 (–11) mm. long, 1.5–7 mm. broad at the base, pubescent on the outer surface, glabrous within or hairy at the base only, bearing a few glands in 2 groups, apex bifurcate $1/3$ – $1/2$ way, lobes straight or diverging. Inflorescence a terminal, di- or trichotomous, many-flowered, diffuse cyme; bracts and bracteoles lanceolate, deciduous, pubescent on both surfaces,

bracteoles larger in opposite pairs, trifid about $1/2$ way. Flowers small, slender, on pubescent pedicels as long as the ovaries. Calyx lobes lanceolate, 1–7.5 mm. long, 0.7–1.5 mm. broad, pubescent on both surfaces or on the outer surface only; petaloid sepal white, oblong or elliptic, 3–12 cm. long, 1.5–9.2 cm. broad, usually glabrous on both surfaces except on veins below or minutely puberulous on both sides, cuneate, 5-veined, “petiole” 0.8–2.5 cm. long and hairy. Corolla yellow or orange, the tube 1.4–2.5 cm. long, hairy on the outer surface (more densely so towards the upper half), hairy within at the mouth, the throat, and between the anthers as far as the anther bases; hairs long in short-styled forms and short in long-styled forms; corolla lobes 1.5–6 mm. long, 2–3.5 mm. broad, lanceolate, broadly ovate or orbicular, acuminate or apiculate, hairy on the outer surface, papillate within. Stamens with short filaments, epipetalous on the upper $2/5$ – $1/2$ of the tube in long-styled forms and $1/4$ – $1/3$ of the tube in short-styled forms; anthers linear, dorsifixed, introrse, 2.5–5.5 mm. long, bilobed at the base, shorter in long-styled forms. Ovary obconical or turbinate, 2–4 mm. long, glabrous or minutely pubescent, 2-locular, with numerous ovules on cushion-shaped axile placentae; style and stigma lobes 1.4–2 cm. and 4.5–7 mm. long respectively in long-styled forms, 1.6–6 mm. and 1.5–5 mm. long in short-styled forms. Berry ovoid-elliptic, 1–1.2 cm. long, glabrous, lenticellate, calyx lobes deciduous; seeds minute, reticulate, 0.67–0.83 mm. long, 0.46–6 mm. broad, testa with 2–7 or 3–14 foveae in each areole.

ILLUSTRATIONS. Loddiges, Bot. Cab. 13: *tab.* 1269. 1827; Rumphius, Herb. Amboinense 4: *tab.* 51. 1743.

DISTRIBUTION. Collected widely from Sikkim, Khasia, Assam, and Chittagong at elevations up to 2440 meters above sea level; in Burma mostly for the Mergui area with *Kingdon-Ward* 22098 from the Triangle in North Burma between 900 and 1500 meters elevation; in Siam from the Chantaboon area; in Singapore from lower altitudes; also in Java, China, and the Ryukyu Islands. (The distinction between *Mussaenda glabra* and *M. erosa* Champ. from China is very little. Bentham (1861) says in reference to *M. erosa*, “It may however be a variety of *M. frondosa* or of *M. glabra* of Vahl, which Miquel unites with *M. frondosa*.”) It has been collected in flower from January to June, September, October, and December; in fruit in January, April, June, and December.

India. SIKKIM: *J. D. Hooker* 17 (GH, K); *Treutler*, 1874 (K); Darjeeling, *Schlaginweit* 12385 (GH); *Cowan, Imp. For.* 24464 (US); Choonbutte, *Clarke* 26603B (K). KHASIA: *Hooker & Thomson* 17 (NY); Silhet, *Wallich* 6250D (C); *Hooker & Thomson* 17 (NY); Mamloo, *Clarke* 43821 (K); Chura, *Hooker & Thomson* 17 (K). ASSAM: *Masters* (GH); *Jenkins* (K); *Jenkins* 501 (NY); Naga Hills, Henima, *Bor* 6471 (K); Mishmi Hills, Sadiya Plain, *Kingdon-Ward* 18588 (A); Janakmukh, *Burkill* 36467 (K); Lushai Hills, Chinchuk, *Parry* 600 (K); Cachar, *Bazer* 146 (K); Sittong, *Biswas* 7473 (PNH); Ledo, *Juan* 76 (A); Ind. Orient. *Herb. Wight* 1266 (NY); Ind. Orient., *Vahl* (c-holotype); cultivated, Calcutta Bot. Gard., *Voigt* (C, A). Burma. NORTH TRIANGLE: *Kingdon-Ward* 22098 (A). RANGOON: Mogok, *Dickason* 5005, 3093 (A). MERGUI:

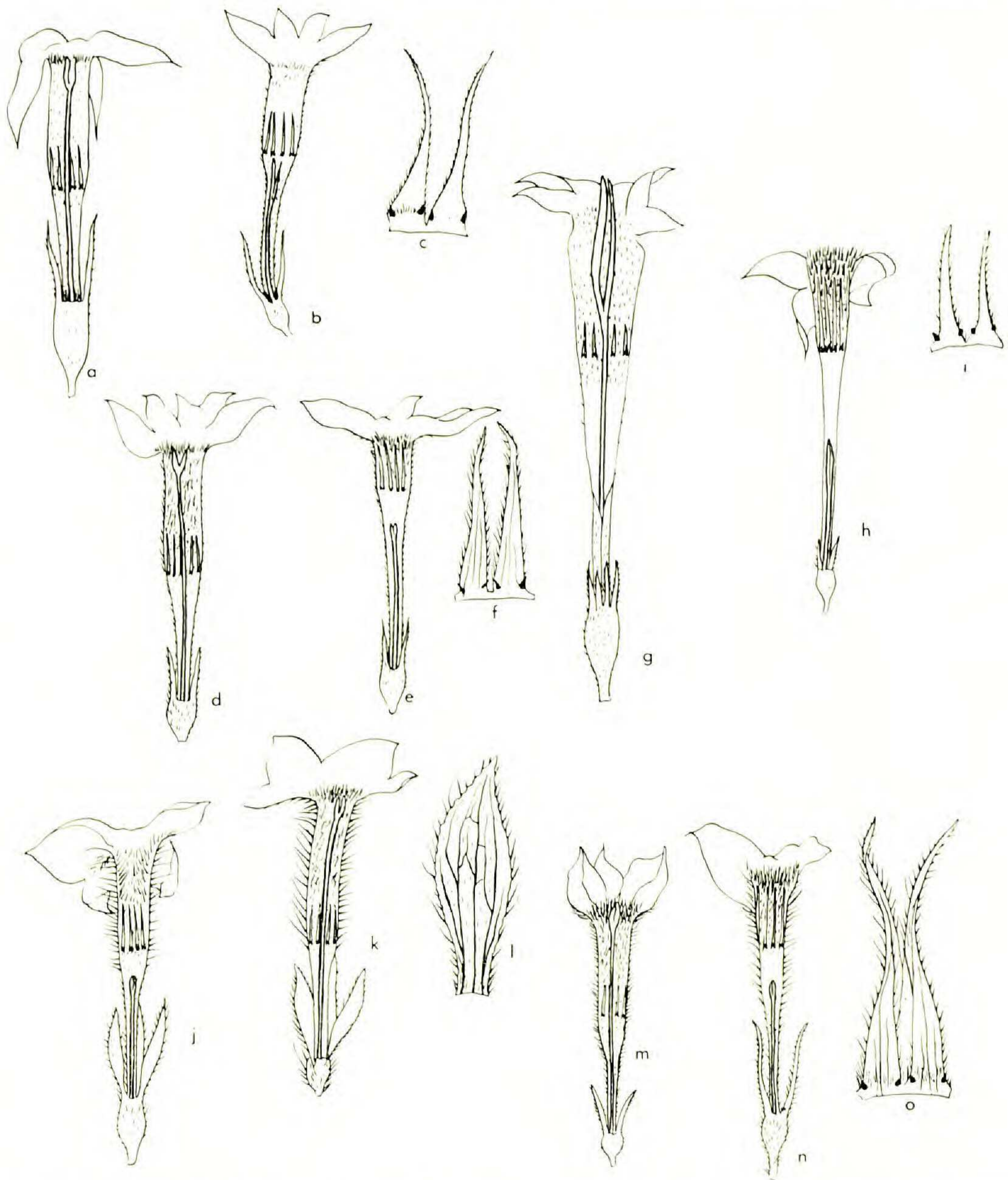


FIG. 3. Longitudinal sections of long-styled and short-styled flowers of some Indian species of *Mussaenda* and calyx lobes seen from within. a-c, *M. roxburghii*: a, (Gamble 10476), $\times 1$; b, (Wallich G 6252), $\times 1$; c, calyx lobes, $\times 3\frac{1}{4}$ (note tufted hairs at base of corolla tube and calyx lobes). d-f, *M. incana*: d, (Voigt 136), $\times 1$; e, (Herb. Griffith 2781), $\times 1$; f, calyx lobes, $\times 2\frac{1}{3}$. g-i, *M. glabra* (Siedenfaden 2696): g, long-styled flower, $\times 1\frac{2}{3}$; h, short-styled flower, $\times 1\frac{1}{2}$; i, calyx lobes, $\times 5$. j-l, *M. macrophylla*: j, (Yü 17681), $\times 1$; k, (Parry 274), $\times 1$; l, calyx lobes, $\times 2$. m-o, *M. hirsutissima*: m, (Gamble 11393), $\times 1$; n, (Barnes 120), $\times 1$; o, calyx lobes, $\times 2\frac{1}{2}$, note hairiness at base of calyx lobes.

Palauk, *Parker* 3079 (NY); Palauk Chaung, *Parker* 3137 (NY); Kwin-ta-bin taw, *Maung Po Khant* 13290 (K); *Herb. Helfer* 2778 (K), Kew Distribution 1861-2; *Griffith* (K). S. TENASSERIM: Kallin kwan chang, *Parkinson* 1692 (K); Chaungnaukpyan, *Parkinson* 1638 (K). Siam. Chantaboon, *Vesterdal* 9B, 9E, K (c); Chantabura, West of Kao Sabab, *Siedenfaden* 2696 (c). China. KWANG-TUNG: Lantau Island, Taai ue Shaan, *Tsang* 16672 (A). KWANGSI: Shap Man

Taai Shan, *Tsang* 22095 (A). Japan. Ryukyu Islands, *Wright* 119 (GH, US). Malaya. Singapore, Pahang, Sungai Bera, *Henderson* 24128 (NY); Bot. Gard., *Clemens* 1013 (NY). Java. *Delessert* (C); *Blume* (NY); *Didrichsen* 3926 (C); Depok, *Jensen* (C); *Soegandirerja* 244 (A); *Reinwardt* (C); *Sargent* (A); *Mousset* 230 (US); Goenoeng Boto, *Franck* 93 (C, GH, US); Mount Salak, *Palmer & Bryant* 371 (US); Nogosari, *Gandrup* (C).

There are two collections included in the type cover (C); one, which agrees with the description of Vahl, I select as the lectotype; the other, with large, oblong-elliptic leaves bearing 13 or 14 pairs of lateral veins, large flowers, and long, pubescent calyx lobes does not seem to belong to this species but rather to be a form of *Mussaenda macrophylla* Wall. Vahl did not mention the locality of the collection he described, but G. Don said it was a native of the East Indies. Delessert's collection from Java closely resembles the type.

Most of the collections from India have been made from elevations below 1500 meters, but *Schlaginweit* 12385 was gathered from Darjeeling between 1830 and 2440 meters elevation.

Hooker divided the species into four varieties distinguished by the character of the leaf base and the proportion of the calyx lobes to the ovary. As there are a large number of transitional forms the boundaries between them can hardly be maintained. Therefore, the species is considered as a whole with variations.

Most of the leaves of gatherings bear 4–6 pairs of lateral veins, except *Herb. Wight* 1266 which has the leaf bases long attenuate and nine pairs of lateral veins. The stipules in all collections are small, except Treutler's which bears stipules about 11 mm. in length with glands in a continuous band at the base. The calyx lobes vary in size but agree in shape and hairiness on the outer surface. In all Indian forms the calyx lobes are glabrous inside, while the type specimen bears short lobes, minutely appressed pubescent on both sides. Although the corolla tube is generally short, the lobes in some forms are broadly ovate or orbicular.

According to the number of foveae in the areoles of the testa of the seed, the specimens of this species fall into three groups which cannot, however, even be considered *formae*. The collections *J. D. Hooker* 17, from Sikkim, and *Burkill* 36467 and *Parry* 600, from Assam, bear 2–7 foveae in each areole of the seed coat, while *Clarke* 26603B, from Sikkim, and *Jenkins* 501, from Assam, bear 3–10 foveae, and still others such as *Hooker & Thomson* 17, from Khasia, bear 3–14 foveae. The seed is reticulate and usually smooth, but there is a tendency toward spininess in some forms (such as *Herb. Wight* 1266 and *J. D. Hooker* 17) but not sufficiently marked to be termed spiny.

Voigt's collections from Calcutta, probably from cultivated material, are of special interest. Of the ten specimens examined, three have been annotated by Bremekamp as *Mussaenda frondosa* and three as *M. glabra*, two specimens have been identified by Merrill as *M. frondosa* and the remaining two as *M. frondosa* by Voigt himself. All these specimens are of the short-styled form with stigmatic lobes as long as the styles. The throat hairs are long and not tufted at the mouth, a character which re-



FIG. 4. *Mussaenda frondosa*: Photograph of type-collection, from Ceylon (Hermann), left-hand specimen lectotype, right-hand specimen syntype. — By permission of the British Museum (Natural History).

moves them from the *M. frondosa* group. The leaves of those which Bremekamp and Merrill have named as *M. frondosa* are elliptic-lanceolate, acuminate, attenuate at the base, short petioled, very scantily hairy on both surfaces, and with 4–6 pairs of lateral veins not unlike Treutler's collection from Sikkim Himalaya. Stipules are small, appressed pubescent on the outer surface, glabrous within with few glands in two groups. The corolla tube is short (2 mm. long) and not tufted at the mouth, and the lobes are lanceolate. As they agree with the typical *M. glabra* in their stipule and floral characters I have reidentified them all as *M. glabra*.

The collections of Parker, Griffith, Helfer, and Parkinson from Burma are conspicuous in their sturdy, trichotomous, many-flowered, diffuse, cymose panicles, glabrous stems, leaves, and larger stipules (7–8.5 mm. long) bearing numerous glands in two groups at the base. The corolla tube is longer (2.2–2.5 cm. long) than in the typical form, the lobes ovate, and the anthers in long-styled forms do not seem to dehisce. Hairs inside the corolla tube of the long-styled forms are short (0.2 mm. long) extending to below the bases of the anthers as far as $\frac{1}{5}$ the length of the tube from the base, a feature not observed in other forms. The specimens of *Kingdon-Ward* 22098 from North Triangle are said to be abundant

at elevations between 900 and 1500 meters. This is a long-styled form, but the corolla tube is shorter (1.5 cm. long) and the throat hairs extend as far as $1/3$ the length of the tube from the base. The style is looped somewhat inside the tube and the stigmas protrude beyond the mouth. The anthers do not seem to have pollen. *Dickason 5005* from Mogok is a short-styled form with the anthers attached to the upper third of the tube. The stipules are typical of *M. glabra*, and the style and stigmas are well developed.

Vesterdal's and Seidenfaden's collections from Siam agree with *Mussaenda glabra* var. 1 of Hooker in the form of the leaves and pubescence, though the flowers are more slender. The stipules are narrow, densely pubescent outside and bifurcate at the apex to about $3/4$ way. *Seidenfaden 2696* (c) has two specimens mounted, one belonging to the long-styled form and the other to the short-styled form. The flowers of the long-styled form bear large stigma lobes (7 mm. long) and reduced anthers (3.2 mm. long) placed lower down in the corolla tube. The ovary is about twice as long as that in the short-styled form.

There seems to be some confusion in the identities of *Mussaenda erosa* and *M. glabra* from China. Collections labeled as *M. erosa* are made up of the true *M. erosa* Ait. (e.g., the collections *Henry 10646*, *13648*, *13694* bearing linear calyx lobes more than twice as long as the ovary) and a form of *M. glabra* erroneously labeled as *M. erosa*. True *M. erosa* differs from *M. glabra* in its stipules bearing numerous glands in a continuous band at the base within and each calyx lobe bearing two or three pairs of glands at the base. *Wright 119* from the Ryukyu (Loo-choo) Islands agrees with true *M. glabra*, but the testa of the seed contains a larger number of foveae (7–17) in each areole.

Four collections from Singapore and Johore were examined. *Henderson 24128* and *Clemens 1013* agree with *Mussaenda glabra* except for their longer sepals and broadly ovate petals. They are short-styled forms, and their style, stigmas, and ovaries are much reduced. Clemens' collection seems to be from a cultivated specimen in the Botanic Gardens, Singapore.

The collections from Java show the greatest variation in the species. They differ from the type in the number of pairs of lateral veins in the leaf, which normally exceeds six, and in the broader corolla lobes. There is a considerable development of the styles and stigmas in the long-styled forms and conversely a reduction in size of these organs in the short-styled forms.

Mussaenda glabra can be distinguished by its glabrous stems and leaves, small stipules with fewer glands at the base within, hairs not tufted at the mouth of the corolla tube (very short in long-styled forms), glabrous fruits with dehiscent calyx lobes, and minute seeds with fewer foveae in the areoles of the testa.

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